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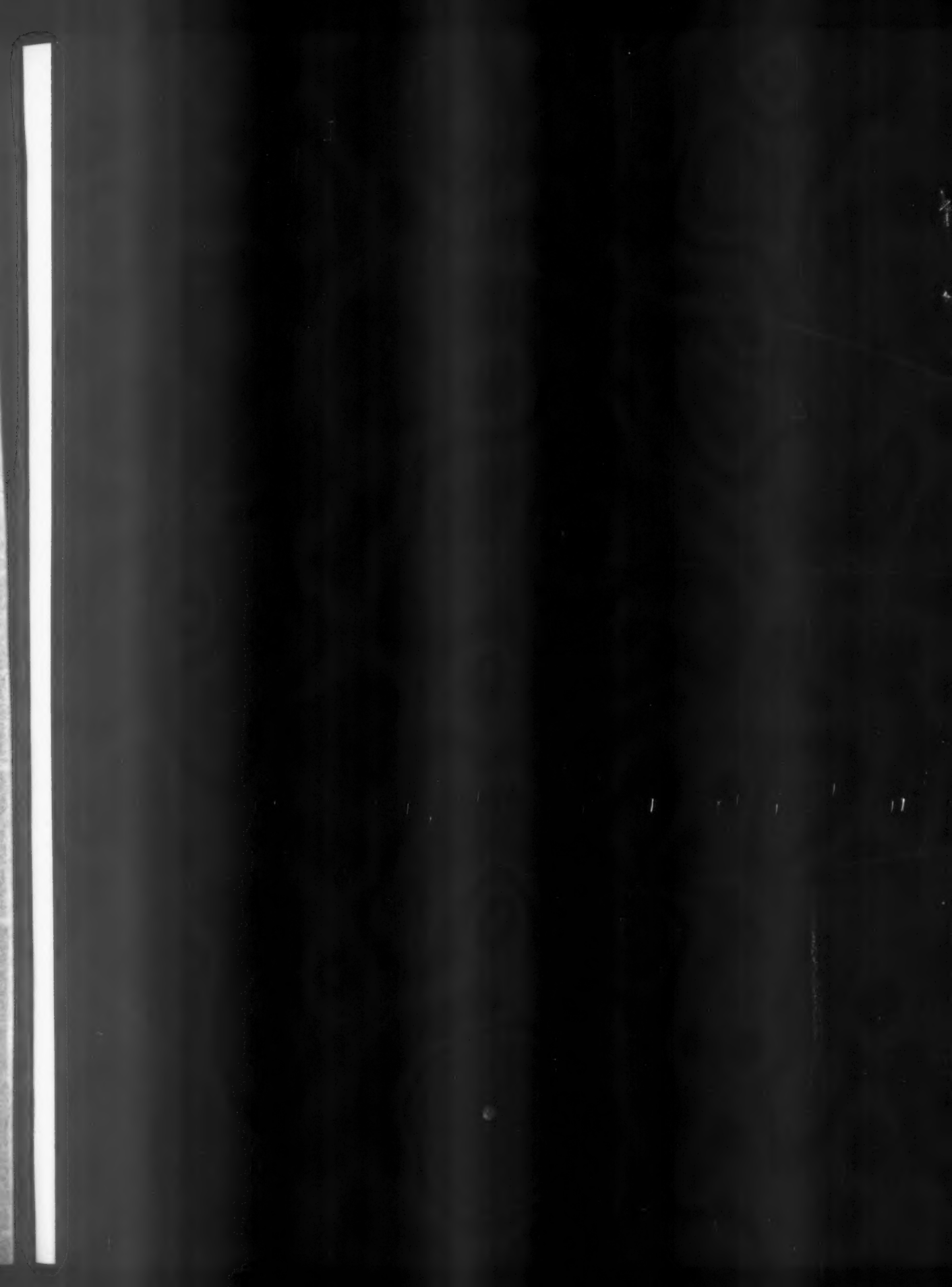

MUNICIPAL ENGINEERING

VOLUME XXIV MAY, NINETEEN HUNDRED THREE NUMBER FIVE

PORTLAND NATURAL AND PUZZOLAN CEMENTS.

AN INTRODUCTORY PAPER.

*By Edwin C. Eckel.**

In a paper published some time ago in a scientific journal** the writer discussed the classification and relationships of the various cementing materials, including in this term, the plasters, limes, hydraulic limes and the natural, Portland and puzzolan cements. Brief notes on the raw materials, methods of manufacture and properties of the various products were included in this discussion. The present article has been prepared to serve as an introduction to a series of papers on various phases of the cement industry, to be published in later numbers of Municipal Engineering. The writer has accordingly attempted in it to give a brief summary of the composition and relationship of the three most important types of cements, i. e., Portland, natural and puzzolan.

These three types of cement, together with the hydraulic limes, have been described by the writer under the term "Silicate Cements." Though differing widely in raw materials, methods of manufacture and properties of the finished product, the silicate cements agree in two prominent features. The first point of agreement is that they are all hydraulic, though in very different degrees; the second, that this property of hydraulicity is, in all, due to the formation of tricalcic silicate (3 Ca O, Si O2), during the setting of the cement. Other silicates, as well as silico-aluminates of lime, may also be formed; but they are relatively unimportant, except in the case of certain natural cements and hydraulic limes where the aluminates of lime may be of greater importance than is here indicated.

The class of silicate cements, as above defined, is divisible on both scientific and commercial grounds, into four distinct groups. The basis for this division is given below. It will be seen that the last named of these groups—the puzzolan cements—differs from the other three groups very markedly, inasmuch as its raw materials are not calcined after mixture, whereas in the manufacture of Portland and natural cements and the hydraulic limes calcination is invariably practiced. The various groups differ somewhat in composition, but more markedly in methods of manufacture and in the properties of the finished product.

—Sub-Groups of the Silicate Cements—

1. Portland cements, produced by the calcination, at the temperature of semi-vitrifaction ("clinkering") of a mixture of calcareous with clayey materials, in the proportion of about three parts of lime carbonate to one part of silica and alumina.

2. Natural cements, produced by the calcination, at a temperature below that of clinkering, of a clayey limestone (which may or may not contain also a notable percentage of magnesia) in which the lime (plus magnesia) is so low, relatively to the silica and alumina, that little or no free lime appears in the cement.

3. Hydraulic limes, produced by the calcination, at a temperature below that of clinkering, of a silicious limestone containing so large a percentage of lime carbonate, relatively to the silica, that a considerable amount of free lime appears in the finished product. The hydraulic limes will not be further discussed in this article, as none are now manufactured in the United States.

4. Puzzolan cements, produced by the mechanical mixture, without calcination, of slaked lime and silico-aluminous material, the latter being either of volcanic origin (trass, pozzuolana, santorin) or artificial (blast furnace slag).

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**The Classification of the Crystalline Cements. American Geologist, vol. 29, pp. 146-154.

As noted above, the hydraulic may be dismissed from consideration in an American publication, as no materials of this type are manufactured in the United States, and the amount imported is not large. The three other cements, however—Portland, natural and puzzolan—are of importance, and will be now discussed separately and at some length, while later articles will deal in considerably greater detail with various phases of their manufacture.

Portland Cement—If we exclude from the Portland class the so-called "natural Portlands," * we may regard Portland cement as being an artificial product, obtained by burning to semi-fusion an intimate mixture of pulverized materials, this mixture containing lime, silica and alumina in proportions which are, within certain narrow limits, fixed and definite; and crushing finely the clinker resulting from this burning. If this restricted definition be accepted, four points may be regarded as of cardinal importance in the manufacture of Portland cement. These are:

1. The cement mixture must be of the proper chemical and physical composition.

2. The materials of which it is composed must be finely ground and intimately mixed before burning.

3. The burning must be conducted at the proper temperature.

4. After burning the resulting clinker must be finely ground.

Natural Cements—This class, though fairly well defined and understood by engineers, contains cements which differ widely among themselves in composition. As commonly defined, it includes all cements manufactured by burning at comparatively low temperatures (i. e., below the clinkering point) limestones containing sufficient silica and alumina to give a hydraulic product. In use, cements of this class may usually be distinguished from Portlands by their lower specific gravity, more rapid set and smaller ultimate strength. Examination of a large series of analyses of American natural cements, collected and tabulated by the writer, shows that cements of this group range in chemical composition between the following limits: Silica, 20 to 30 per cent.; alumina and iron, 6 to 20 per cent.; lime, 30 to 60 per cent., and magnesia, 2 to 40 per cent. The mere statement of this range in composition shows what the group of "natural cements." The widely different products are included in least variable of the constituents is the silica, as might indeed be expected to be the case, in view of the fact that this element, to a large extent, is the cause of the hydraulic properties of the product.

Puzzolan Cements—The cements included in this group are made by mixing, without burning, slaked lime and either a natural volcanic ash or a blast furnace slag of proper composition. In various part of Europe natural materials, such as pozzuolana, trass and santorin—all of volcanic origin—are extensively utilized in the manufacture of puzzolan cements. In the United States, however, the only representative of the class of puzzolan cements is slag cement, made by intimately mixing powdered slaked lime with powdered granulated slag of proper composition. The processes of manufacture include the selection, granulating and drying of the slag, the burning and slaking of the lime, the mixing of the materials in the proper proportions and the fine grinding of the resulting mixture, together with any means which may be employed for regulating the rate of set of the product.

* The composition and manufacture of the "natural Portland" cements will be described, if possible, in a future article of this series.

THE FILTRATION PLANT OF THE KINGSTON WATER-WORKS.

The city of Kingston, New York, derives its water supply from the Saw Kill, a stream in the Catskill Mountains, and some auxiliary ponds and reservoirs. The population upon the watersheds of these streams is small but is increased during the summer season by the summer visitors from the cities.

The State Board of Health has adopted a series of rules and regulations for the sanitary protection of the water, which fix the methods of disposing of house wastes, manures, animal and vegetable matter and manufacturing wastes, bathing and washing of animals, and the management of the reservoirs. These regulations are quite strict and capable of thorough protection of the purity of the water if properly enforced, and the penalties attached are sufficient to make failure to obey the rules very expensive. The city, as a further safeguard, as well as to keep the water clear under all conditions of weather, has installed a mechanical filter plant of sufficient capacity to treat the entire supply for the city.

THE FILTER HOUSE. KINGSTON, N. Y., WATER-WORKS.

A pipe line from reservoir No. 2 of the city supply passes reservoir No. 1, from which a second pipe line parallels it to the city. Just below reservoir No. 1 is located the filter house, shown in one of the accompanying photographs. It is of blue stone ashlar, 55 feet by 62 feet 7 inches, and has a concrete floor.

JOHN F. GALLAGHER.
Supt. Kingston, N. Y., Water-Works.

On the first floor are eight mechanical filters, four on each of the two supply mains described above. The combined capacity of the eight filters is 4,000,000 gallons a day. The largest of the accompanying photographs shows the filter room, the ends of the filters and the piping necessary. According to the report of the consumption of water in the last annual report at hand the nominal capacity of the filters was slightly exceeded in the average for one winter month and was closely approximated in two summer months. For the remainder of the year it was ample. The total consumption of the city is measured by two Venturi meters in the filter house with automatic registers. The registers are shown in one of the small photographs.

About two-thirds of each filter cylinder is filled with layers of crushed quartz, white sand and coke, through which the water filters under the action of gravity. In the bottom of the filter are brass tubular strainers which are filled with gravel to prevent the sand in the filter from washing out with the flow of filtered water. Usually the water from the reservoirs is quite clear, but its appearance is improved by the filtration and in times of flood much suspended matter must be removed. About one-twelfth grain of sulphate of alumina per gallon of water is used to aid in precipitating the floating matter, including the bacteria.

Each filter is cleaned once in twenty-four hours under ordinary conditions, but when the water is turbid two or three cleanings a day may be necessary. this is done by forcing the water up through the bottom of the filter and discharging the dirty water through a waste pipe shown in the drawing. Ten minutes time is occupied in the process. The filtering material is renewed about once in two years. One of the small photographs shows the second floor of the filter house and the hand wheels for operating the seventy-two valves which are necessary for the operations of filtering and of cleaning the filters.

We are indebted to John F. Gallagher, the superintendent of the works, for the photographs and to the report of the Board of Water Commissioners of the city of Kingston for the information given. Another illustrated article will show the sources from which the city's water supply is derived and the methods of collecting and impounding it.

BRICK AS A PAVING MATERIAL.

The relative value of brick as a paving material can be determined according to the arbitrary scales assumed by Baker and by Tillson in their books on pavements and paving materials, but local conditions should modify the values assumed by them. Their general principles were stated in a preceding article on "The Principles Upon Which the Choice of a Street Pavement Depends" in vol. xxiv, p. 270.

With reference to brick as a paving material the following points may be made:

As to cheapness: Tillson assigns a percentage of 14 to the ideal pavement and Baker one of 15; that is to say, cheapness is of importance in the choice of a pavement in the proportion of 14 or 15 to the 100 points in all assigned to the various excellencies of the pavements.

Tillson assigns the percentages for

RELATIVE VALUES OF THE DIFFERENT QUALITIES OF VARIOUS PAVEMENTS.

(COMPILED FROM TABLES IN TILLSON'S AND BAKER'S BOOKS ON PAVEMENTS.)

MATERIAL.	CHEAPNESS.				DURABILITY.		EASE OF CLEANING.		EASE OF TRACTION.		GOOD FOOTHOLD.		EASE OF MAINTENANCE.	ACCEPTABILITY.		SANITARY QUALITIES.	
	Tillson.		Baker.														
	Cost per sq. yd.	Percentage assigned.	Cost per sq. yd.	Percentage assigned.	Tillson.	Baker.	Tillson.	Baker.	Tillson.	Baker.	Tillson.	Baker.	Tillson.	Tillson.	Baker.	Tillson.	Baker.
The Ideal pavement	....	14	....	15	21	20	15	10	15	10	7	5	10	5	15	13	25
Gravel	....	....	$0.50	15	....	6	....	1	....	5	....	5	....	....	6	....	21
Cobblestone	$0.40	14	....	....	15	....	2	....	4	....	5	....	2	0	....	2	....
Macadam	0.75	7	0.75	10	7	8	5	3	6	6	7	5	3	5	8	5	21
Brick on concrete	2.00	3	1 75	9	13	14	12	9	12	8	6	4	6	4	11	11	15
Rectangular wooden block	....	....	2.00	8	....	12	....	9	....	7	....	1	....	....	10	....	18
Sheet asphalt	1.75	4	2.75	6	15	16	15	10	15	10	3	2	6	5	13	13	20
Belgian block	1.40	5	....	....	17	....	7	....	6	....	3	....	7	2	....	5	....
Granite on sand	1.65	4	....	....	17	....	8	....	6	....	5	....	7	2	....	7	....
Granite on concrete	2.50	2	3.50	3	21	20	11	6	7	3	6	3	10	3	9	9	9

NOTE—In Professor Baker's table the item of acceptability is divided into freedom from dust and mud, ideal and asphalt 10, brick 9; comfortable to use, ideal, gravel and macadam, 3, brick 1; non-absorbent of heat, ideal, gravel and macadam 2, brick, asphalt, granite and wood, 1. The item of sanitary qualities is divided into noiselessness, ideal, gravel and mac adam 15, brick 7; healthfulness, ideal and asphalt 10, brick 8.

cheapness of the various paving materials in proportion to their average cost in Brooklyn in 1897, giving the maximum, the mark of perfection, to the cheapest. Baker assumes average costs and modifies the percentages for the better materials according to his judgment. The first four columns in the accompanying table show the figures with reference to this quality, taken from the tables of the two authors.

The relative positions of the materials in the two tables are the same with the exception of brick, which is more than usually expensive in the district in which Brooklyn is situated, and asphalt, which is estimated quite high in cost by Professor Baker. Another city will have different prices on account of different costs of raw materials, different freight charges and different labor cost, so that the order for that city may be somewhat different from either of those shown. In some cases the character of traffic and the quality of foundation material may be such that concrete will not be needed to support the wearing surface, thus reducing the cost of brick, granite, Belgian or wooden block streets perhaps 25 per cent. and improving their position in the table materially. The first thing to be done is evidently to estimate as closely as possible the cost of the various pavements for the city under study, as a basis for the assignment of percentages. The greater freedom given to the judgment by Professor Baker in making the assignments requires expert advice and with competent assistance should give more satisfactory results than strict adherence to an arbitrary rule.

As to durability: Both authors assign to this quality a value about one-fifth that of the whole and Mr. Tillson also has an item of ease of maintenance which is so closely related that the two may be combined. Both affect the cost of maintenance and in somewhat differing degrees the average condition of the pavements, which would affect the acceptability of the pavement or the favorableness to travel, as Mr. Tillson names it. Mr. Tillson bases his durability percentages upon his estimated life of the various pavements, which are, granite on concrete 25 years, on sand 20 years, brick 15, asphalt 18, Belgian block 20, macadam 8, cobble 18. He takes no account of the portion of the cost of maintaining a pavement which depends on the interest on first cost, this being included in the consideration of cheapness. Professor Baker seems to modify slightly the percentages which would be obtained from a comparison of length of life on this account. His estimate of the life of a granite pavement is 20 years instead of 25 and the estimates for other pavements are reduced in about the same proportion. These are averages and should be quite materially modified for the conditions of a given street. Thus the durability of a good brick pavement on a street with little travel is indefinitely long and the cost of maintenance is very low, while the travel on such a street may be so slight that the life of an asphalt pavement will actually be shortened on account of the lack of exercise, while wooden pavements by shrinkage and swelling, and macadam pavements, by washing in heavy rains and the like may require very large repairs in proportion to traffic.

The relative durability is therefore dependent upon the conditions on the particular street and the ranks assigned in the table may be materially changed by them. In fixing a value for a brick street the quality of the brick to be obtained is a very important factor. In some cases it puts first cost for a good street so high or durability for a street of the material readily obtainable so low that it rules out brick entirely. This has been very nearly true in the eastern states, particularly New England, as indicated by Mr. Tillson's high price for brick.

As to ease of cleaning: Tillson gives much more weight to this item than Baker, but the relative position assigned to the various materials is the same. The methods of cleaning in vogue, the thoroughness and the frequency demanded have much influence. In a large city where public opinion is educated to clean streets the importance of this item is greater than in small cities where but little is expected and rough and ready methods are employed. In the table brick occupies a high place, asphalt only standing above it. In a city or town where cleaning is infrequent it may easily happen that the street will be so dirty that an asphalt street will rot out before its time, while a brick street will have its life prolonged by the protection from wear thus secured. In such cases, and they are many, ease of cleaning is not a factor of importance and durability when uncleaned is a far more important consideration, under which brick takes higher rank than any other material except granite or cobblestone.

As to ease of traction: Tillson again gives much more importance than Baker, but with the exception of granite the relative positions of the materials are the same. This is true notwithstanding the fact that the values given for the tractive resistance of various pavements by the two authors differs materially. Thus Tillson gives sixteen pounds as the

HORIZONTAL FILTERS AND PIPING. KINGSTON, N. Y., WATER-WORKS.

force necessary to draw a ton on asphalt, while Baker's own experiments show seventeen to thirty-seven pounds. Baker's experiments would place brick in advance of asphalt in ease of traction, while in the table he reverses their position. In hot weather the tractive force required on asphalt is largely increased, and this may require reduction in the percentage value for that material in southern cities. A steep street will completely change the values as to ease of traction. Here, too, great smoothness is a detriment, and on such streets special values for ease of traction and good foothold must be assumed placing asphalt and smooth wood streets low in the lists and the rougher granite and Belgian pavements high, with macadam and gravel near them and brick not far below.

As to good foothold: In addition to the above remarks it may be said that both authors use the same experiments and give the same relative positions to the materials, except that Tillson gives granite a much higher position. Brick is but one point below the maximum in either case, only macadam and gravel surpassing it.

As to general acceptability: Baker gives three times the weight that Tillson gives, but the latter includes only favorableness to travel, while the former gives 3 per cent. to comfort, 10 to freedom from dust and mud and 2 to nonabsorption of heat. The differences in judgment are shown in the columns under this heading in the table. There is the greatest chance for "personal equation" both in the amount of importance to be assigned to this quality and to the relative place of the materials. This is where the personal preferences of the citizens using or living on the street can have their place. In case this is admitted Prof. Baker's percentage of 15 will probably be more satisfactory than a smaller figure. Too much weight must not be given to nonexpert opinion, but one-sixth does not seem to be too much to allow to personal preferences, and the values assigned within this limit may easily turn the scale in case of two or more pavements which approach equality on other grounds.

As to sanitary qualities: It is doubtful if engineers generally will assign as high values to sanitary qualities as Prof. Baker has done. One of the strongest arguments in favor of pavements in general is that based on their sanitary qualities, but when it comes to a choice between the several pavements the sanitary question takes a secondary place rather than the prominent first place assigned by Prof. Baker. This is indicated by the fact that the lowest value is for granite, and is further shown in his book in which healthfulness is discussed. Perhaps Tillson's assignments of percentages for acceptability and sanitary qualities will be more generally approved. There is certainly great difference of opinion between the authors on both these grounds and others will differ from both of them. Brick holds a high place in Tillson's list, perhaps higher than it deserves when noise is considered. A new brick filler is offered, however, which may warrant Mr. Tillson's high opinion of the sanitary qualities of brick by materially reducing the noise of travel over it. Large claims are made for it and tests are said to be in progress.

To sum up the evidence regarding brick as a paving material, in the light of the consideration of the points of quality named. Under average conditions it will be seen that it is a pavement of less than average cost, according to the average figures of Prof. Baker, not exaggerated by the special conditions in Brooklyn, and is the cheapest of any hard paving materials, gravel and macadam being scarcely admissible to consideration as paving materials except in a most general discussion in which any improvement in street surface is called paving. In case local conditions of soil and drainage, weight and amount of traffic, etc., permit, a less expensive foundation than concrete may sometimes be used, which will reduce the cost somewhat. In durability it stands high in the list, being exceeded only by the forms of granite and asphalt among acceptable pavements and under some circumstances surpassing the latter. In case of cleaning it is surpassed only by asphalt, likewise in ease of traction, and Prof. Baker's experiments place brick in advance of asphalt in hot weather or warm climates. In good foothold it surpasses all the hard pavements but granite, which it equals. In ease of maintenance brick has an average position, in general acceptability and sanitary qualities, except noisiness, it is near the first rank.

Notwithstanding its high position in all these regards the choice of it or any material for a given street should not be made until values for all the qualities named have been assigned for the conditions of the particular street, since it may take quite different rank when these local or special conditions receive the consideration due to them.

THE VENTURI METER REGISTER. KINGSTON, N. Y., WATER-WORKS.

VALVE ROOM. KINGSTON, N. Y., FILTER HOUSE.

INVESTMENTS AND EARNINGS OF MUNICIPAL ELECTRIC PLANTS.

By Alton D. Adams, Boston, Mass.

Eighteen cities and towns in Massachusetts own electric lighting plants. Under the law in this state nine of these cities and towns were forced to purchase their original plants at excessive prices. The other nine plants were built by the towns in which they are located. Interest and depreciation charges bear heavily on the purchased plants, and they are not considered further here. The purpose now is to determine the ratio of net earnings to investments in the plants built by the towns. Having done this, the results will be compared with the ratio of net earnings to investments in similar plants owned by private corporations.

The towns that have built electric plants, their populations and the years when the plants began to operate are as follows:

Town.	Population.	Plant Started.
Danvers	8,542	1889
Braintree	5,981	1892
Peabody	11,523	1892
Wellesley	5,072	1892
Needham	4,016	1893
North Attleboro	7,253	1894
Marblehead	7,582	1895
Reading	4,969	1895
Concord	5,652	1901

The Concord plant is not considered because its report does not include a full year.

Of the eight municipal plants here considered, that at Needham does only public lighting, and the commercial lighting of the Wellesley plant is trifling in amount. The other six plants regularly supply private consumers as well as street lamps.

The earnings of municipal plants from their commercial service, of course, take the form of money, but the value of the street lighting done by them must be estimated. To obtain a fair basis for such estimates, the true average prices paid for energy used in arc and incandescent street lamps, by forty-four towns of the state, have been computed for the year ending June 30, 1900, as has been shown in detail elsewhere. These forty-four towns include almost all of those in the state with less than 12,000 population each, except towns where the electric street lamps are supplied from large generating plants in cities, or by private corporations that own both gas and electric plants. The sums paid as taxes to these forty-four towns by the electric corporations are deducted from the total amounts which the towns pay for electric street lighting, before the average payment per unit of energy in this lighting is determined. The average prices paid for electrical energy by the forty-four towns, less taxes, were found to be 9.69 cents per kilowatt hour for service in incandescent and 12.02 cents per kilowatt-hour for service in arc street lamps. These prices are used to compute the money value of the street lighting done by the eight municipal plants.

To determine the amounts of energy supplied to street lamps by the municipal plants, the total candle power-hours of operation for arc and for incandescent lamps during the year are computed. Then the energy in each sort of lamp is computed by the factors of 0.00025 kilowatt-hour for each nominal candle power-hour of arc lamp, and 0.0035 kilowatt-hour for each nominal candle power-hour of incandescent lamp service. The value of service in street lighting by municipal plants is now determined on the basis of 9.69 cents per kilowatt-hour for incandescent lamps, and 12.02 cents per kilowatt-hour for arc lamps.

To obtain the total earnings of the municipal plants, the values of street lighting are added to the incomes from sales of light and power and from jobbing. This total, less operating expenses, leaves the net earnings. These operating expenses cover all yearly charges against the plants, save those for investments, interest, depreciation and sinking funds. In those cases where electric light has been furnished in public buildings from municipal plants, the value of this light at the regular commercial rates has been included in the money income.

Investments in municipal plants include all sums that have been spent at any time for real estate, construction and equipments, except that all repairs are charged to operating expenses, and in no case to investments.

KILOWATT-HOURS SUPPLIED TO ARC AND INCANDESCENT STREET LAMPS.

Town.	To Arc Lamps.	To Incandesc't L'ps.	Total Value.
Danvers	64,241.4	.....	$ 7,721 82
Braintree	58,597.3	20,363.6	9,016 63
Peabody	199,180.8	6,945.8	24,614 58
Wellesley	.....	71,503.9	6,928 73
Needham	.....	50,077.4	4,852 50
N. Attleboro.	.....	95,259.4	9,231 24
Marblehead.	184,726.1	15,124.4	23,669 63
Reading	59,810.1	.....	7,189 17
Totals	566,555.7	259,274.5	$93,224 30

In the case of each town the net earnings as found above are divided by the

BROAD STREET, MANKATO, MINN. BEFORE PAVING.

investment in the municipal electric plant to determine the per cent. of net earnings during the year.

INVESTMENT AND NET EARNINGS OF MUNICIPAL ELECTRIC PLANTS.

Town.	Investment.	Net Earnings.	Per Cent.
Danvers	$ 47,457 00	$ 3,043 70	6.41
Braintree	97,619 00	4,429 48	4.53
Peabody	82,348 00	17,615 48	21.30
Wellesley	17,000 00	2,664 87	15.60
Needham	16,473 00	1,951 28	11.80
N'th Attleboro	76,883 00	7,324 16	9.50
Marblehead ...	91,018 00	22,424 67	24.60
Reading	76,065 00	2,753 60	3.62
Totals	$504,863 00	$62,207 24	12.32

The highest per cent. of net earnings to investment is 24.6 in the case of Marblehead, and the lowest is 3.62 per cent. for Reading. In the eight plants there was a total investment of $504,868, and their combined net earnings amounted to $62,207.24, a true net earning for all the plants of 12.32 per cent. of their combined investments.

To determine the investments of private corporations engaged in electric lighting it is necessary to know the sums paid for their outstanding stocks and bonds. The par values of the stocks and bonds issued by electric corporations prior to 1894 do not necessarily represent the sums paid by the original purchasers. By an act of the Massachusetts legislature, approved June 5, 1894, the Board of Gas and Electric Light Commissioners authorizes issues of stocks and bonds for not less than par value, and requires that the proceeds be devoted to items of investment entirely. A fair and reliable comparison may, therefore, be made between the earnings of invested capital in the municipal plants above considered, and the like earnings of electric corporations whose entire issues of stocks and bonds have been authorized under the act named, provided the latter serve towns of about the same populations as the towns where municipal plants are located.

Fourteen electric lighting corporations have made their entire issues of stocks and bonds since and under the act of June 5, 1894. One of these corporations operates an electric plant in the city of Woburn, and another served several towns that are substantnially suburbs of Boston. In perfect fairness to the municipal plants the two corporations just mentioned should be excluded from the comparison, because cities usually present better markets for electrical supplies than do towns. The number of electric corporations that have issued their first stocks and bonds under the act mentioned is so small, however, that the two last named are included in the comparison.

The operations of these corporations are considered for the year ending June 30, 1900, the same during which the results noted for municipal plants were reached. The investment of each company is taken as the sum of its stock, bonds and notes outstanding.

POPULATIONS SERVED BY PRIVATE ELECSYSTEMS, AND THE DATES WHEN FIRST ISSUES OF STOCK WERE AUTHORIZED.

Location of Plant.	Population Served in 1900.	First Issues of Stock Authorized.
Grafton	8,188	1894
Attleboro	11,335	1894
Natick	16,863	1895
Revere	16,453	1895
Nantucket	3,006	1895
Leicester	3,416	1895
Lenox	2,942	1896
Western	1,834	1896
Whitman	6,155	1896
Westboro	5,400	1897
Woburn	27,699	1897
Medfield	2,926	1898
Medway	2,761	1899
Blackstone	5,721	1896

It is necessary to include notes payable of these corporations with their stocks and bonds to determine investments because it is the practice to pay for new construction with notes, before stocks or bonds are issued to cover the amounts. The earnings of electric corporations as here treated include their incomes from all sources, such as rents, jobbing and minor items in addition to that from the sale of light and power. Operating expenses cover all items of manufacture, distribution, management, repairs and incidental expenses, as was the case in the municipal plants. Taxes form an item in the expenses of private corporations, as considered here, because taxes were deducted from the sums paid for street lighting in the forty-four towns. The charges against operation include nothing for interest, depreciation or sinking funds.

The difference between gross earnings and operating expenses for each plant is divided by the sum of its stocks, bonds and notes representing the investment, to determine the percentage of net earnings during the year. In the fourteen plants the total of stocks and bonds is $861,000, and the notes payable amount to $145,861.74. The entire investment is thus $1,006,861.74, or $72,000 in each plant, on an average. For each of the eight municipal plants the average investment was $63,000.

BROAD STREET ASPHALT PAVING. MANKATO, MINN.

INVESTMENTS AND EARNINGS OF PRIVATE CORPORATIONS OWNING ELECTRIC SYSTEMS.

Location of plant.	Stocks and bonds.	Notes payable.	Net earnings in 1900.	Per cent. net earnings to sum S. B. and notes.
Grafton ...	$ 10,000	$ 3,000.00	$ 740.51	5.6
Attleboro .	75,000	6,500.00	6,431.00	7.8
Natick	124,000	31,130.16	3,006.92	1.9
Revere	85,000	.....	15,237.54	17.9
Nantucket.	25,000	.....	1,869.98	7.4
Leicester .	25,000	.....	745.26	2.9
Lenox	20,000	.....	2,926.02	14.6
Weston ...	12,000	18,500.00	3,306.96	10.8
Whitman .	40,000	.....	2,900.78	6.1
Westboro	25,000	19,600.00	4,751.86	10.6
Woburn ..	338,000	24,624.74	25,138.75	6.9
Medfield ..	60,000	22,866.84	*289.62	*0.3
Medway ..	12,000	.....	2.29	0.0
Blackstone.	10,000	17,640.00	2,310.48	8.3
Totals	$861,000	$145,861.74	$69,659.97	6.9

*Loss in operation.

Sum of stocks, bonds and notes, $1,006,861.74.

Net earnings of the fourteen private corporations amounted to $69,659.97 for the year, or a percentage of 6.9 on the investment. In one case the system earned less than its operating expenses by a sum equal to 0.3 per cent. of its investment. Ten of the fourteen corporations earned less than 10 per cent. on their investments, above expenses. The largest rate of return on capital was 17.9 per cent., the net earnings at Revere.

In connection with the favorable showing of this Revere plant, it should be pointed out that the company operating it was formed in 1895 to purchase the property of the North Shore Electric Company, which had just been taken on foreclosure of mortgage by the bondholders. Up to the time of foreclosure the North Shore Company had issued stock to the amount of $125,000, bonds for $75,000, and had $50,249.62 in notes payable outstanding, a total of $250,249.62. For the entire property of the North Shore Company the sum of $75,000 was paid by the present operators of the plant, a sum equal to simply the face value of the bonds. It seems probable, therefore, that the exceptional rate of earnings for the Revere plant may be due in part to a low investment in comparison with its actual assets.

Comparing the fourteen systems operated by private corporations with the eight municipal plants, it appears that the rate of net earnings of the latter was 78 per cent. greater than the like rate for the former, on an average. Moreover, there are fewer extremely low rates of earnings in the municipal than in the private plants. No municipal plant shows an actual loss, and the lowest rate of net earnings among these plants is 3.62 per cent. Of the private plants, four show a rate of net earnings not above 2.9 per cent., in ten systems the rate of net earnings was below 10 per cent., and in only one case did the rate reach 15 per cent.

Four of the municipal plants, or one-half of the total number, earned a net rate of more than 10 per cent., three earned more than 15 per cent. and two went above 20 per cent.

As all the municipal electric plants that towns have been permitted to freely build and all the private corporations that operate electric systems in towns and have issued all their stocks and bonds under supervision of the commissioners, have been considered, a fair conclusion may be reached. This conclusion is that municipal plants, when under the direct control of the entire body of voters, as is the case in Massachusetts towns show a better rate of earnings than similar plants owned by private corporations. Whether equally favorable results can be achieved by municipal plants under any system of representative government is quite another question.

A PROGRESSIVE MINNESOTA CITY.

The state of Minnesota has but six cities with a population of more than 10,000, and the smallest of these is Mankato, which showed in the last census a growth of 20 per cent. in population during the preceding ten years.

A system of sewers was begun about fifteen years ago and has been extended each year until it now has a total length of main sewer of 40,670 feet, costing $69,489. During 1902 the extensions were 3,930 feet of small sewers costing $4,218.

The water works system is owned by the city and has cost $121,051, for which there are yet outstanding $87,000 in bonds. Nearly 6,000 feet of new pipe were laid in 1902 at a cost of $6,782. The revenues of the water works for the year were $14,709, all from water rents and sales but $1,779 proceeds of a five-cent frontage tax. The operating expenses were $4,679; repairs and maintenance cost $1,486, and $4,005 interest in bonds was paid. The profit on the operation of the water works

ASPHALT PAVEMENT. BROAD STREET AT MAIN. MANKATO, MINN.

was $2,510. The city receives free of cost water for public services and 145 fire hydrants estimated at $35 each, all computed at $8,410, showing the total net profit of $10,920. These figures do not include the frontage tax, which may be considered as an offset to the free water furnished the city, and goes to increase the cash balance with which to make extensions and pay bonds. There are 73,820 miles of water mains, about 80 per cent. more than of sewer mains. This does not include 4,278 feet of supply pipes. The report of the department does not state how the money for extensions is raised nor does it show what provision is made for retiring the bonded indebtedness. If these are taken care of from the general funds of the city they will offset the charge for free water and still show the works to be in good financial condition. The source of supply is two 650-foot artesian wells. There are two pumps each of 1,500,000 gallons' capacity and pumping against a head of 223 feet, with an 870,000-gallon auxiliary reservoir. The cost of pumping 1,000,000 gallons against this head, based on the running expense of the station, is $14.73; with maintenance of plant added the cost is $19.09. If interest on the total investment at 5 per cent. and depreciation at 4 per cent. are added, the cost becomes $50.69. The cost per million gallons raised 100 feet cannot be computed exactly as the lift of the water from the well to pump is not stated. The average daily consumption is 870,391 gallons, and if thirty million gallons estimated annual free water are deducted, the average daily use per capita of consumers (7,248) is 109. Computed on the population of the city (10,600) using the entire quantity of water pumped, the per capita consumption is 82 gallons a day. No meters are reported. The city paid $2,484 for street sprinkling, being 25 cents per 100 feet of street per week in the main street and 18 cents for all other work.

The principal advance of the city in improvement during the year was in the partial completion of a contract for paving Broad-st. with asphalt by the Barber Asphalt Paving Company. Twelve of the fifteen blocks of the contract were completed. As the accompanying photograph of the street before improvement will show it is a handsome street 100 feet wide. The narrowing of the roadway to thirty feet, the new sidewalks and the broad lawns with trees materially improve the appearance of the street, as shown by the three remaining views of the street as improved.

The contract price for the street was $1.93 a square yard for 5-inch concrete foundation, 1-inch binder and 1½-inch wearing surface. A combined 8-inch curb and 18-inch gutter of cement cost 59 cents a linear foot. The guaranty period for the pavement is ten years. In addition to this improvement, on which $40,000 was paid, about $13,000 was spent on the streets in repairs, $16,000 for sidewalks and $1,600 for private curbing.

This makes the total expenditures on public works, including water works, nearly $92,000 for the year. The cost of the engineer department was $1,338, or 1.4 per cent of the cost of the work. We are indebted to the city engineer, J. R. Thompson, for the photographs accompanying this article and to him and his annual reports for the information.

The question of the method of payment for the Broad-st. pavement is as yet unsettled. The pavement was ordered as a public necessity and on application by some of the property-owners the lower court enjoined the city from paying for the pavement or assessing the property for its cost. The supreme court reversed the decision of the lower court on all material points, but continued the injunction on the ground that a change in the manner of payment, made to evade the earliest decision of the lower court, was a discrimination in favor of the lowest bidder. The city has since been heard on its claim that the change was actually against the contractor, and as such should not be ground for continuing the injunction.

The next proposition for the improvement of the city is the construction of a municipal electric light plant. Litigation over this is now in progress and the plans and bids thereon are in condition for immediate procedure with construction if a decision favorable to the city is rendered.

ASPHALT PAVEMENT. BROAD STREET AT MULBERRY. MANKATO, MINN.

EDITORIAL COMMENT

Basis for Appraisal of Water-Works Plant.

Uniform Tests for Cement.

Business and Politics in City Administrations.

BASIS FOR APPRAISAL OF WATER WORKS PLANT.

The determination of the value of a water works plant is so subject to difference of opinion that some account of the instructions by the supreme court of Maine in a problem of this sort will be of interest. Appraisers were appointed to determine what the Kennebec Water District should pay for the property of the Maine Water Company, and the instructions were issued to them after full discussion in court of the points at issue.

The city is required to take all the property of the company used for operating the works within a described district. The principles laid down are that the water rates of the company must be reasonable, calculated on the fair value of the property used by it, with account taken of the value of the service to the individual water consumers; i. e., the company has a right to a fair income, taking into account the cost of maintenance and operation and depreciation, and the value of the service. The chance of failure taken by the original investors is accepted as a just reason for allowing a profit somewhat greater for a time, and the amount and rate of decrease of this extra profit as the business of the company improves is to be determined by the appraisers, possibly all of it having disappeared.

The values of the franchises held by the company are to be determined with due reference to the fact that they are not exclusive, perpetual nor irrevocable, and that there is actually no competition.

The actual cost of construction with allowance for depreciation is competent evidence, but is not conclusive nor controlling, likewise the cost of reproducing the plant at the present time, which will throw some light on its present value.

The actual rates charged and the actual earnings are material evidence, provided the rates have been pronounced equitable. So are the condition of the plant, the quantity of water and its ability to meet reasonable requirements.

The company is to be considered as a going concern on its present merits and with its present duties, without reference to past acceptability of its service or charges therefor, for any failures in the former of which it is declared to be free from danger of forfeiture of franchises, neither can any deductions be made for overcharges or excessive profits in the past.

No damages can be allowed the company on account of the reduction in its total business on account of the sale of the portion of it wanted by the city nor for individual damages to other unconnected property.

Real estate not directly connected with the water system, but situated within the district must be appraised at its fair market value, not at forced sale.

The element of good will is not to be considered, the system being exclusive, but the value of the franchise to the seller, not to the buyer, is to be determined and allowed. This value is held to depend upon the net earning power, present and prospective, developed and capable of development, at reasonable rates. The prospective value is to be modified by a consideration of the necessity of further investments and of future reduction in rates to render them reasonable under future conditions. The fact of this proceeding is to have no effect in determining the value of the franchise.

Capitalization of income is not considered a fair measure of present value, even at reasonable rates.

The present efficiency of the system, the length of time necessary to reproduce the plant and the time and cost necessary to develop the business of a new plant to the standard of the present one and the advantages to the purchaser of the present plant over those of a new plant on this account are details of less importance, which are to enter into the consideration.

Most persons will agree with nearly all these instructions. Probably the point on which there will be the greatest disagreement is in the method of determining the value of the franchise.

In an open market the right to do business and the good-will are very closely allied and it is difficult to separate them. Both must be considered in determining the purchase price and future probabilities of development have their proper

share in fixing the price. This development depends very largely upon the ability of the managers of the company and they should reap the benefit of their efforts.

In the case of a public utility, however, such as this system of water works, there is a practical monopoly, no matter what are the terms of the franchise, and the future development of the business, as well as its present condition, depends not only upon the business ability of the managers, but to a much greater extent upon the development of the community served, whether in population, wealth or in demands for service.

It would seem, therefore, that there is some element of good will in the business, corresponding, perhaps, to the portion of the development of the business depending upon the ability of the managers, and it is clear that a very large share of the development is dependent directly upon the development of the community, in which the company has only a secondary share. The portion termed good-will is properly a matter for compensation in purchasing the plant, but the portion depending upon the general development of the city is only slightly dependent upon the fact that the company gives water service, and its value belongs to the city alone, and no compensation is due the company therefor. This is usually the bone of contention in attempts to transfer ownership to the municipality and the company points to its own share in the development and tries to make it overshadow all other factors, while extremists in the other direction would demand for the city all the franchise value. The truth lies between the two and in most cities nearly all of the franchise value belongs to the city and should not be paid for in the transfer of ownership. There are towns in which the growth of works is due almost entirely to the efforts of the owners, but such stationary towns have not been so numerous in the past as they will be in the future. In such cases the value of the franchise is probably not large, but it belongs almost entirely to the company.

UNIFORM TESTS FOR CEMENT.

At the annual meeting of the American Society of Civil Engineers January 21, 1903, the special committee on uniform tests of cement presented a progress report giving preliminary statements of the methods of testing cement, which had been practically agreed upon by the committee, and reserving the privilege of changing any portion of the report and of adding other matter, agreed upon in committee when its final report is made.

As may be seen from a perusal of the portion of the report printed on page 289 of our April number, including the subjects of sampling, chemical analysis and specific gravity, the report is carefully prepared and gives full detail of all operations. It does not give specifications for cement, stating what the behavior of acceptable cement must be under the tests, excepting in the case of normal consistency and constancy of volume.

At a meeting of the Canadian Society of Civil Engineers held January 27, 1903, the committee on a standard specification for Portland cement and to consider standard Portland cement tests made its report. The field of this committee is somewhat larger than that of the American Society committee, since it makes a specification for cement as well as fixes methods of testing the cement in accordance therewith. Liberal extracts from the report will be found elsewhere in this issue. It is not so full nor so carefully prepared as the other referred to.

It is interesting to note the substantial agreement of the two reports upon most of the important matters touched upon in both of them, and the material differences in opinion regarding methods of manipulation.

In the test of fineness the American sieves are Nos. 100 and 200, while the Canadian sieves are Nos. 50 and 100, the No. 50 being practically of little value since the specification requires that all the cement shall pass through it. In methods of manipulation the differences are marked, the American method using the hands to shake the sieves and suggesting the use of a small quantity of large shot to expedite the work, while the Canadian report recommends a mechanical mixer operated for a definite length of time and deprecates the use of "small weights such as washers" as affecting the results objectionably.

The American report considers the damp cloth for covering briquettes while setting to be objectionable and much prefers the damp closet or box which it describes. It objects to mixing machines for making pastes to form briquettes for several reasons, particularly the difficulty of keeping the machine clean and the cement from balling up, and describes a method of hand kneading, and, discarding moulding machines as unsatisfactory would fill the moulds by pressing the paste in with the fingers and smoothing off the over full mould with a trowel. The Canadian report prefers Faija's mix-

er to hand work and, while placing hand and machine filling of moulds on a par for common work, states that doubtful cases should invariably be decided by ma-machine made briquettes. Any standard testing machine, using solid metal clips without cushions is permitted by the American report, adding load at 600 pounds a minute, while the Canadian requires the machine to be of the positive lever automatic type, recommends clips with adjustable rubber or paper composition rollers and would add the load at 200 pounds a minute.

These differences can hardly be termed fundamental. Doubtless expert operators in the various methods can obtain results comparable with each other's as well as among their own, and practice has more to do with the results than the exact methods followed. It is so difficult to obtain uniformity in a single society that agreement in all details is hardly to be expected in two independent reports. The conformity of the two to the same general standards is more remarkable than the differences in detail.

BUSINESS AND POLITICS IN CITY ADMINISTRATIONS.

From a paper before the Convention of the National Municipal League at Detroit, April 22, by the editor of Municipal Engineering, the following paragraphs are taken, the subject being "The Municipal Situation in Indianapolis," and some additional comments are inserted:

"The municipality is a business proposition, and has nothing in common with political parties of either state or nation, whatever may be the necessities of practical politics. As such it should be administered on business principles. It is a very common principle that there must be no division of responsibility. The stockholders of a company put their interests in the hands of a board of directors who determine the policy of the organization, and officers are elected to put this policy into operation. The responsibility for the administration of the policy is concentrated upon a single head, and that for carrying out the detail of each department upon a single subordinate who is responsible directly to his executive superior up the line to the head of the entire administration.

"The theory of the government of the City of Indianapolis varies little from this. The stockholders (voters) elect once in two years, instead of once a year, as in the ordinary stock company, the city council as the legislative authority and the mayor as the executive head. The council does not have all the powers of the ordinary board of directors, since it does not elect the mayor, and does not determine the policy of the administration nor the method of carrying it out. The voters have decided at the polls what policy they wish to follow for the next two years and the initiative in carrying it out is conferred upon the mayor. The council stands by to approve or disapprove of certain classes of operations, to pass the necessary legislation and make the necessary appropriations for carrying on the administration and thus has a check upon departures from the policy fixed upon before election. It also has the duty of inspection of methods and investigation and report upon derelictions of duty.

"To take charge of the detail of the various departments of municipal activity the mayor appoints three members of a board of public works and a city engineer subordinate to them, a board of public safety, a board of public health, a city attorney and a city comptroller, who form his advisory cabinet. None of these appointments are confirmed by the council and all are revocable by the mayor at his pleasure. Each head of department appoints his own subordinates, and in some cases heads of sub-departments have the appointment of their own subordinates."

The opportunities for success and failure in the administration are compared in the paper with those of the stock company and are shown to depend upon the same conditions of competence of stockholders to choose their officers and attention to their business.

"Honesty and efficiency in municipal administration are not matters of legislation and it is impossible to devise any system of city government which will eliminate dishonest and incompetent officials if the voters are so careless or so ignorant that they will elect men of objectionable character to office. The best which the legislature can do is to give the city a form of government which will be efficient in reasonably good hands and the management of which can be changed promptly and completely when that becomes necessary. These are the prime qualities of the form of government in Indianapolis and in several other Indiana cities. The change of one official, the mayor, can change the entire character of the administration, and this change can take place at any biennial election.

"The consequence is that the city has exactly as good an administration as its citizens want, and can improve it or the reverse at any time it so desires."

The necessities of practical politics in Indianapolis as in other cities have developed two well-organized machines, one of them having existed nearly or

quite as long as the charter and the other having developed its full strength in the last four or five years, but notwithstanding his strong hold upon his party machine the political boss seems to have even less power over the city as a whole than in cities with greater division of responsibility. The size of the independent vote keeps the administration close to the demands of its constituents, and even slight departures result in defeat at the next election.

Business methods are more nearly possible under the Indianapolis system than in most cities, but they will not continue under any system unless the citizens demand them in an intelligent and urgent manner.

THE QUESTION DEPARTMENT

SCREENS FOR WATER SUPPLY INTAKES.

Is copper wire commonly used for water supply intakes? As you see by enclosed sample, the brass screen cloth has not proven a success. Strands that run across the cloth hold while the strands that run the other way give out. The cloth has been in use about two years. What firms make cloth of copper wire and what difference, if any, is there in the cost of same over the brass wire? W. L. BISHOP.

Supt. Streets and Water Works,——, N. S.

Copper wire is more generally used than brass wire for screens for water supply intakes. It costs 50 per cent. more than brass wire cloth. Thus the mesh of brass wire cloth ordinarily used for the finer screen costs about 30 cents a square foot, and copper wire cloth of the same mesh costs 45 cents. Copper wire will corrode less rapidly than brass and is probably worth more than the actual difference in price.

A business directory gives the names of the Gilbert Bennett Manufacturing Company, Georgetown, Conn.; U. T. Hungerford Brass and Copper Company, 497 Pearl-st., New York; W. S. Tyler Company, 133 Devonshire-st., Boston, Mass., as makers of brass and copper wire cloth. Merchant & Co., Philadelphia, also deal in these materials. The Jeffrey Manufacturing Company, Columbus, O., lists brass wire cloth in its catalogue.

Perforated copper plates are used in some instances successfully, especially for the outer or coarser of two screens used in series.

BOOKS ON PLAIN AND ORNAMENTAL CEMENT WORK AND ARTIFICIAL STONE.

I would like a book on artificial stone, the methods of making, machinery, molds, etc. P. L. BRITAIN,

Busch, Okla.

I would like to have a publication which deals with ornamental artificial stone work, also with retaining walls, copings, gutters and caps for walls, different styles of steps, foundations, cellars, concrete houses and fancy ornamental work for walls, dams, etc., just as near an encyclopedia as possible, from one or more books.

R. E. DE ARMOND,

Los Angeles, Cal.

Most of these applications of cement are treated in the "Directory of American Cement Industries and Handbook for Cement Users" ($5). There is no book in English devoted to ornamental work in artificial stone. In fact, there is but little on the manufacture of artificial stone in any English books. Reid's "Manufacture and Use of Portland Cement" and "Practical Treatise on Natural and Artificial Concrete" ($6) have some charters on artificial stone, the silicating process, etc., some short statements of which will also be found in Jameson's "Portland Cement" ($1.50). The modern methods of making artificial stone are most of them quite different and have not yet found their way into books.

There are many articles in back numbers of Municipal Engineering which will be of assistance in applying the processes described in the "Handbook" to special constructions. The substance of those appearing before the latest edition of the "Handbook" was issued is contained in it. Others will be found in every number of Municipal Engineering for 1902 and 1903. Some of the more important are the following:

Several articles on Concrete Building Blocks, vol. xxii, pp. 13, 161, 163; vol. xxiii, pp. 392, 482; vol. xxiv, pp. 192, 234, 279.

Concrete Sewers, vol. xxii, pp. 19, 20, 169, 324; vol. xxiii, p. 450; vol. xxiv, pp. 253, 275.

Concrete in Buildings, vol. xxii, p. 20; vol. xxiii, p. 392; vol. xxiv, pp. 88, 128.

Portland Cement Concrete and its Uses, vol. xxii, pp. 29, 80, 96, 237.

Cement Curbs, Crossings, Walks, Steps, Floor, vol. xxii, pp. 90, 91, 160, 161, 162, 167, 230, 231, 266, 304; vol. xxiii, pp. 31, 98, 178, 179, 242, 254, 255, 430, 448, 482; vol. xxiv, p. 275.

Concrete Bridges and Arches, vol. xxii, pp. 137, 159, 167, 231; vol. xxiii, pp. 108, 155, 179, 199, 400, 477; vol. xxiv, p. 127.

Specifications for Concrete, vol. xxii, p. 224.

Ornamental Artificial Stone, vol. xxii, p. 231.

Concrete Walls, Cracks in, vol. xxii, p. 304.

Mold for Concrete Wall Construction, vol. xxii, p. 337; for artificial stone, vol. xxiii, pp. 98, 112; for curb and gutter, vol. xxiii, p. 450.

Concrete Streets and Foundations, vol. xxiii, pp. 98, 179; vol. xxiv, p. 191.

Reinforced Concrete Beams, vol. xxiii, p. 126 tests, 449 strength.

Machine for Making Cement Bricks, vol. xxiii, pp. 180, 450; vol. xxiv, p. 192.

Cement Lined Reservoirs, vol. xxiii, p. 258.

Hardening Cement Surfaces, vol. xxiii, p. 451.

A Concrete Amphitheater, vol. xxiii, p. 476.

The Use of Concrete in Architecture, vol. xxiv, p. 256.

An Application of Concrete-Steel construction to Retaining Walls, vol. xxiv, p. 287.

This list shows that Municipal Engineering is perhaps the leading cement periodical as well as the only one covering the entire field of municipal improvements. The "Directory" covers the field of the practical manufacturer, testing, sale and use of cement better than any other book and Municipal Engineering intends to keep its readers up to date in the cement field, as well as in others, in the intervals between the frequent editions of the "Directory."

Reference may be made to the "Business Directory" under the heading of "Cement Construction" for names of manufacturers of machinery and inventors of processes for making ornamental artificial stone, from whom information can be obtained which is not yet furnished for publication except in articles such as those above listed.

MORE CEMENT BLOCK MACHINES.

Which do you consider the best concrete block machine?

M. F. CHAMBERLIN, Boulder, Colo.

This is a question which each one must answer for himself. As stated in an article on cement block machines, page 192 of the March number of Municipal Engineering, the various blocks and machines have their special points of excellence and must be selected with reference to the class of work desired.

New machines, in addition to those described in the article referred to are that of K. Dykema & Son, Grand Rapids, Mich., some information concerning which will be found in our advertising pages, the Winget machine of Columbus, O., and the Van Camp machine of Indianapolis.

BOOKS ON CEMENT.

Will you please send me a catalogue of works on cement and lime, subjects which I wish to study up?

AUSTIN GALLAGHER,
Hagerstown, Md.

A descriptive list of books on cement was given in Municipal Engineering, vol. xxiii, p. 177, to which reference should be made. These are all printed in English.

There are several excellent works in other languages. Among the recent books at hand are Zamboni's "Il Cemento Portland," a full study of the products of an Italian manufacture, which was reviewed in this magazine in vol. xxiv, p 46; Morel's "Le Ciment Arme et ses Applications" (3 fr); Naske's "Die Portland Cement Fabrikation" (11.50 mks); Lucht's "Anleitung fur die Verarbeitung und Verwendung von Portland Cement."

Special attention is called to the "Directory of American Cement Industries and Hand-Book for Cement Users" ($5) as the most practical and complete book on the practical manufacture, testing and use of cement. Municipal Engineering Magazine ($2 a year) is the best medium for keeping up with the rapid advances in the use of cement and its back volumes contain much valuable information which has not yet had time to get into the text-books. Golinelli's "Das Kleine Cement-Buch" has been translated into English by S. B. Newberry and can be obtained for 50 cents under the title of "How to Use Portland Cement."

CONCRETE MACHINERY AND BUILDING BLOCKS.

In addition to the answer to a question by F. M. of Pittsburg, Kas., under the above heading, which appeared on page 279 of the April number of Municipal Engineering we are informed that a factory for the manufacture of cement building blocks with the Noyes F. Palmer adjustable cast stone press has been established at Waterloo, Ia., of which A. O. Tabor is the general manager.

CEMENT FACING FOR SEA WALL.

We have a masonry wall for a swimming pool, built in tide water, which was laid up dry and pointed on both sides with cement concrete. During the cold weather in winter the cement pointing and facing cleaves off, which necessitates repointing every spring. Is there any method of doing this work or mixing the cement which will cause it to stand cold weather? The water leaves the wall at low tide.

G. C. B., Winter Harbor, Me.

Sea water has a deleterious effect upon some cements, but this seems rather to be a case of a porous wall, in which the freezing and thawing of water has the mechanical effect of breaking the bond of the cement of the pointing and the stone of the wall. There might be some such effect under the circumstances described even if the wall had been laid up as solid as possible, but it would be very much less than in a wall which has accessions of water at each tide to freeze in the interstices and loosen and force off portions of the cement facing. The wall might be relaid or grouted with cement after the spring repointing, watching for leakages and waste of the grout through defective spots in the facing, and being sure to use a cement which has demonstrated its durability in sea water. Even then the wall is likely to give some trouble on account of the difficulty of making and keeping it water-proof under the trying conditions of this case.

WHERE TO GET FINE CRUSHED STONE.

Where can we buy some finely crushed stone of a good hard quality that would pass through a No. 16 or No. 18 sieve, or about like marble dust?

F. L. SEAGE,
Lansing, Mich.

This question is referred to our readers. The producers of granite nearest to the inquirer are those in Wisconsin, from some of whom the material desired can probably be obtained, such as the Western Consolidated Granite Company, Ableman; Archie Bros. Company and Pike River Granite Company, Amberg; Berlin Granite Company, Berlin; Milwaukee Monument company, Milwaukee.

Crushed stone can be obtained of the following firms near but outside of Michigan: The Bedford Quarries Company and the Cleveland Stone Company, Chicago, Ill.; and Thos. Bridges's Sons and Philip Hipskind & Sons, Wabash, Ind; Miami Stone Company, Toledo, O. The proportion of material as fine as desired is small in the ordinary crushing plant, but doubtless by special arrangements any desired amount can be obtained at some slight advance in price.

There are two or three firms which make a specialty of powdered limestone for asphalt paving and other purposes. C. J. Osborne, 140 Maiden Lane, N. Y., is reported to be a broker handling this material.

The St. Louis Crushed Quartz Company, 311 Roe Building, St. Louis, Mo., makes a specialty of fine stone and of siftings for art stone. Their product is a hard dolomite.

CONCRETE FOR APARTMENT HOUSE.

I am planning to put up the walls of an apartment house of concrete molded in place, and if you have any articles on the subject I want them. Are there patents in conflict with simple molds to make hollow walls?

R. M. EDWARDS, Appleton, Wis.

The following articles in Municipal Engineering refer directly to the subject as stated: In vol. xxi, "Concrete Construction. Mixtures and Manner of Placing in Forms," p. 112; "Concrete for Buildings," p. 214; "Basement Walls of Concrete," p. 339; "A Concrete Dwelling," p. 362; in vol. xxii, "Concrete vs. Stone Masonry in Buildings," p. 20; "Cracks in Concrete Wall," p. 304; "Mold for Concrete Wall Construction," p. 337; in vol. xxiv, "Concrete Building Construction," p. 88; "The Use of Concrete in Architecture," p. 256. There are many more articles on other uses of concrete in building and on other methods of using cement, in blocks for example.

There are patents on hollow blocks of various forms and walls built of them, but the writer does not know of any which would be infringed by the use of a simple mold to make a hollow monolithic wall.

PRICES FOR CEMENT WORK. INFORMATION ON COFFER DAMS.

Will you give the latest prices on cement work? Where can I get some ideas on coffer dams for both deep and shallow water?

A. B. WHITTAKER,
Tenkhannock, Pa.

The price of cement is rising so fast that prices for work are not very stable. The cost of other materials and of labor have also acted to increase the cost of cement and concrete work materially. Some statements of bids for contracts received during March and April are at hand from which the following are taken:

Portland Cement Concrete—At Washington, D. C., $8 to $8.50 per cubic yard; Atlantic City, N. J., the same; in breakwater at Burlington, Vt., parapet, $8 to $10, footing blocks $9 to $18, decking $8 to $10, in bags $9 to $10; at Little Sodus Bay, N. Y., $7 to $9, blocks $11.50 to $12.80; at Cape Vincent, $8.25 to $9, blocks $11.50

to $12.70; at New Orleans, first grade $7.90 to $12, second grade $7.25 to $10, third grade $5 to $7; in water filters at Washington, D. C., in floors $4.37 to $6.96, walls $5.60 to $7.56, piers $6.60 to $9.26, vaulting, $6.87 to $8.16; in Jersey City, N. J., conduit, $3.50 to $9, bid on small quantities for extra work.

Concrete Foundations for Pavements—New York City, $5.48 to $6.40 a cubic yard; Brooklyn, $4.90 to $7; most bids about $5.50.

Concrete retaining wall in Brooklyn, $5 per cubic yard.

Concrete sewers in New Orleans cost much on account of depth, in many cases 18 to 22 feet and water in soil. Bids ranged from $10.80 for sewer 3 ft. 3 in. diameter and 16 feet deep to $31.92 for sewer 5 ft. 9 in. diameter and 22 feet deep. Concrete manholes 12 feet deep cost $62 to $90.

Concrete Curb and Gutter—Sandusky, O., 65 cents per linear foot; Shelbyville, Ill., 48 to 50 cents. Concrete curb, Fall River, Mass., 74 cents to $1.03, straight and 86 cents to $1.20 curved; Davenport, Ia., 35 to 60 cents; Boone, Ia., 50 to 52 cents; Bakersfield, Cal., 35 cents; Brooklyn, N. Y., 50 cents; Ogden, Utah, 70 cents to $2.25. Concrete gutter, Ogden, Utah, 85 cents to $1.75 per linear foot.

Concrete Walk—Bakersfield, Cal., 13½ cents per square foot; Brooklyn, N. Y., 18 to 25 cents; Ogden, Utah, 13 to 18 cents.

Portland Cement—Worcester, Mass., $2.14 to $2.35 per barrel; Meriden, Conn., $2.75 to $2.85; Wheeling, W. Va., $2.34 to $2.42; Minneapolis, Minn., $2.39 to $2.44.

Natural Hydraulic Cement—Rosendale at New York, $1.04 in barrels, 96 cents in sacks; at Minneapolis, Minn., Milwaukee, 75 to 90 cents; Austin, 92 to 93 cents; Mankato, 90 cents; Louisville, $1.

The subject of coffer dams is a large one and the best method of becoming acquainted with its principles is to study the chapters in books on foundations, which are set apart for it. Good books for this purpose are Fowler's "The Coffer Dam Process for Piers" ($2.50), Patton's "Practical Treatise on Foundations" ($5), Baker's "Masonry Construction" ($5). The last two have excellent chapters on tthe subject of coffer dams, though the treatment is not so full as that in the first, which gives details of many actual constructions of various kinds, descriptions of machinery and apparatus and specifications.

INDEXES TO CURRENT TECHNICAL LITERATURE.

We beg to inform you that we have decided to undertake the publication of a monthly Index, containing a record of the principal articles published by the technical press of the world. Each entry or summary will include, in addition to the title of the article and its origin, a short and concise statement giving an idea of the nature of the article and its importance. The various summaries will appear in the language of the article—English, French, German, etc.

You speak in your letter to us of other indexes: would it be asking you too much to let us have a list of those which, to your knowledge, already exist? ASSOCIATION DE LA PRESSE TECHNIQUE, Bruxelles, Belgium.

The North of England Institute of Mining and Mechanical Engineers, M. Walton Brown, Secretary, Newcastle-upon-Tyne, England, publishes an annual "Subject-Matter Index of Mining, Mechanical and Metallurgical Literature. The volume for 1900 has been published, price 42 shillings, and the volumes for 1901 and 1902 are promised for early issue. The volume at hand has about 200 pages, and indexes over 350 periodicals, reports, society proceedings, etc. The locations of abstracts of articles as well as of the originals are stated. While the title of the index apparently restricts it to a limited field, an examination of the contents shows that all subjects having any possible connection with the general lines named in the title are included so that machinery, lighting, building materials and construction, gas, water, sewers, etc., have their share of the space.

In the United States there are several partial indexes of the same sort. The American Society of Civil Engineers publishes each month a list of the principal articles which have appeared in about seventy publications received at its library. The titles are grouped under the headings of Bridge, Electrical, Marine, Mechanical, Metallurgical, Military, Mining, Miscellaneous, Municipal, Railroad, Street Railroad, Sanitary, Structural, Water Supply, Waterways. Being printed on one side of the sheet, the groups of titles can be cut out and filed each group in its own file.

The American Institute of Architects, Glenn Brown, Secretary, Washington, D. C., publishes a quarterly list of articles of interest to architects.

The first publication of this kind in America was started by J. B. Johnson in the Journal of the Association of Engineering Societies in 1884, and published monthly. The index was collected into a single volume in 1892, containing the notes for seven years. Another volume was issued in 1896, covering four years. It covered about sixty periodicals. The Engineering Magazine of New York began the publication of a similar index, and in 1869, the two were consolidated and

are now published in the monthly numbers of the magazine and collected into volumes at intervals. It now covers over 180 periodicals. In the latest monthly number the department of civil engineering occupies four pages, that of electrical engineering six and one-half pages, gas works engineering one page, industrial economy one page, marine and naval engineering one page, mechanical engineering eight pages, mining and metallurgy five pages, railway engineering three pages, street and electric railways one and a half pages.

BOOKS ON FOUNDATIONS.

In addition to your list of books for the city engineer's library I would like a work in detail on foundations in quicksand, suitable for work up to twenty feet depth of such sand.

B. S. REEVES, Guthrie, Ok. T.

Baker's "Masonry Construction" ($5), which was included in the above list, has an excellent treatment of the subject of foundations. Patton's book on "Foundations" ($5) is devoted to this subject exclusively. The principles and methods developed in these books can be applied directly to the class of material mentioned. An excellent little book on the subject is Gaudard's "Foundations" (50 cents), which is a translation from the French. It has, of course, the limitations due to its size. Fowler's "The Coffer-Dam Process for Piers" ($2.50) is an excellent book to study in this connection. It is confined to the one method of putting in foundations, but this is in many cases the best method for the class of foundations named.

TABLES OF LOGARITHMS.

I want a little information in addition to the article on books of logarithms and circular functions which appeared in your April number. I have several works containing logarithmic tables, but they all end with 10,000. I want a table in large type where they are carried to 100,000 at least, and also containing natural and logarithmic circular functions to single minutes, carried to six places of decimals at least. What are the differences between Bruhn's and Vega's tables? ——, Newcastle, Pa.

In addition to the article on logarithmic tables on page 281 of the April number, it may be said that the extent of a logarithmic table depends upon the number of significant figures to which the table is carried. The ordinary 6-place table gives four significant figures and that is one reason why it is not much more accurate than the 5-place table, which also gives four significant figures without interpolation. A 7-place table gives five significant figures, and, therefore, answers the requirement of carrying the table to 100,000, in fact the usual 7-place table extends to 108,000. Of course that means many more pages, and if the pages are so arranged that there are 50 numbers in the left hand column to each page of logarithmic table it will take over 180 pages. A 5-place table arranged in the same manner takes 18 pages. As stated in the answer published in the April number the ordinary 6-place table in the Engineers' Pocketbook is not conveniently arranged for it does not have 50 numbers to the page. Henck's table takes 15 pages and has no proportional parts. Searle's gives the proportional parts, and is irregularly divided on the pages and consequently takes 27 pages.

Bruhns' tables give the 7-place numbers from 1 to 1,000 on the first four pages, arranged 50 numbers in a column. Then follow the 7-place logarithms of numbers of 4 and 5 places in the usual form, the left-hand column giving those numbers with four places and the other nine columns the last four places of the logarithms of numbers with each digit in the fifth place, occupying 180 pages. The proportional parts of all tabular differences are given in a column on the right-hand side of each page, and the logarithmic sines and tangents of five arcs of numbers of seconds corresponding to 5 numbers on each page are given at the bottom. The logarithmic circular functions, sine, cosine, tangent and cotangent of arcs from 0 to 6 degrees are given for every second, taking 185 pages and the remainder to 45 degrees are given for every ten seconds, taking 224 pages. The proportional parts for interpolations are given in the right-hand column. There are some valuable tables of constants and their logarithms. There are several other tables differing in details, some being designed specially for astronomical calculations and others for more general purposes. Such are Kohler's, Vega's (Bremiker's edition) and Schron's. There are also English tables such as Babbage's, Shortrede's and Chambers'. The 7-place table is not convenient for ordinary calculations, being intended for the more elaborate computations of astronomical problems. But few of the problems of the physicist and engineer require the degree of accuracy obtainable from them. A careful inspection of them should be made by one proposing their use with special reference to their adaptability to the class of computations to be made.

Jones' tables are again recommended as probably the most satisfactory for gen-

eral use. They are of 5 and 6 places and by interpolation will give numbers to 100,000 with sufficient accuracy for ordinary purposes. The 7-place tables do not give the natural functions.

Webb's new book on "Railroad Construction" ($5), a review of which is in preparation, contains some more than usually satisfactory 5-place tables of logarithms of numbers and of all circular functions to single minutes, with full tables of proportional parts. The natural circular functions are given for each 10 minutes to 4 places, with proportional parts for interpolations.

DEALERS IN PORTLAND CEMENT IN THE SOUTH.

Please furnish me with the address of reliable dealer closest to this point who handles first-class Portland cement suitable for sidewalks and driveways, either American or imported. J. W. S.,
Columbus, Miss.

Reference should be made to the "Directory of American Cement Industries and Handbook for Cement Users" ($5) for names of such dealers. Birmingham and Mobile, Ala.; Memphis, Tenn., and New Orleans, La., seem to be the most accessible points of distribution, but sales agents in cities as far distant as Charleston, S. C., and St. Louis, Mo., consider this district as a part of their field. The list of dealers in the "Directory" gives not only names and addresses of dealers, but also credit ratings for those doing a cement business extended beyond their own city. The list of sales agents gives the names of the brands handled by each agent and of the manufacturers of the same.

FOUNDATION FOR BRICK PAVEMENT.

Have you any information on the experiment of laying brick on a well-packed sand and gravel soil with a two-inch sand pad underneath the brick, and then use asphalt and sharp sand filler to cement the brick together and keep the water from seeping down between the brick? It is supposed by some that it would be quite as good as to use eight inches of crushed rock and roll the crushed rock with a heavy roller, and then use two inches of sand pad covering and lay the brick on the aforesaid sand pad, and fill the spaces between the brick with sand. If you can give me any light on the subject you will oblige.
H. S. HOOVER.
City Engineer, Waverly, Iowa.

The best foundation for a brick pavement is always the concrete foundation, with as thin a "sand pad" as possible, not more than one inch, if the upper surface of the concrete is as smooth as it should be. The best foundation may sometimes be a waste of money, however, for the lightness of traffic, the excellence of the soil, the completeness of drainage and the perfection of the construction may be such that the brick surface will practically retain its uniformity upon a much less expensive foundation. Just what this foundation should be will depend upon the quality of the construction and materials in the items just mentioned. There are excellent streets on rolled gravel foundations, and there are poor streets laid with foundations of broken stone or bricks laid flat, the difference being mainly in the quality of the sub-grade and the perfection of the drainage. It would not be safe to choose between the two methods of construction mentioned in the question without intimate knowledge of the materials and power to fix the method of drainage. The principles on which the choice should be made may, however, be stated.

The loads which may be concentrated upon wheels rolling over the pavement are a prominent factor. On a busy city street they demand a concrete foundation. On a residence street in a village heavy loads are so infrequent that they need not be considered, and the choice of foundation may be made on other grounds. On streets intermediate in this respect the question must be considered and a broken stone foundation may be required for the loads on a business street in one town, while another would require concrete and another would be well served by a gravel foundation.

A common cause of the failure of brick streets on other than concrete foundations is the lack of effective drainage. If water can collect in the foundation or in the soil beneath in sufficient quantity, it will expand in freezing sufficiently to heave the pavement, or it will, at least temporarily, make the soil unequal in compactness and thus permit uneven settlement and finally cause the destruction of the smoothness of the pavement if not of the pavement itself. It is not necessary for this effect that the foundation be full of water. If it is retentive enough so that the particles of water in freezing will expand more than enough to fill the voids adjacent to them, the same effect, possibly in less degree, will be produced. The broken stone or gravel foundation gives the necessary size of voids to prevent this heaving effect. If the water fills the voids in any portion of the foundation these materials will be heaved by the frost in the same manner as less porous materials, or those with smaller voids, but it is seldom that the

drainage of a brick pavement is so greatly neglected as this occurrence would indicate. And, in fact, the porosity of the gravel and broken stone foundations is such as to lead the water to the outer limits of the pavement and thus under most of its area there is none to freeze and heave. Even with a sand filler the amount of water getting through the joints to the foundation is very slight, except where defects in surface or in drainage cause the water to stand, in which case small amounts may find their way to the soil beneath. This will happen even with asphalt or tar filler, because this filler will soften and run out of the joints in hot weather, and thus escape its duty, except, fortunately in the gutters, where an impervious filler is most to be desired.

If these principles are applied to the packed sand and gravel foundation described in the question their effect can be estimated. If the foundation is rolled in place it is very difficult to pick out all the soft spots and to get the foundation uniformly compact, so that a heavy concentrated load could easily make injurious depressed spots in passing over the pavement. The smaller size of voids might give opportunity for the freezing of water and heaving of pavement as described, and then for the depressions from concentrated loads on account of unequal solidity. Perfect drainage would remove this danger. Water tight joints would add to the security, if they can be obtained.

If the sub-soil is excavated and thoroughly rolled and the sand and gravel are filled in and compacted as they are put in place, greater uniformity in solidity can be secured. If the proportion of fine gravel and sand is not too great the retention of water with slightly imperfect sub-soil drainage will be less and the durability of the pavement will probably be greater. As stated in the beginning, the probabilities of success in the cases under consideration can be judged only with intimate knowledge of the materials and conditions.

With either gravel or broken stone foundation the voids must be filled to such an extent that the sand cushion will keep its place on top. Otherwise its leakage into the voids below it will cause inequalities in the brick surface. The surface of the stone or gravel should be rolled until it is smooth, so that the sand cushion can be made as thin as possible. This is especially so if any of it is likely to leak into the foundation, for the less the thickness of cushion the less unevenness in brick surface from its disappearance.

N. B. M. A. TESTS FOR PAVING BRICK.

Can you give me the name of the Secretary of the National Association of Brick Manufacturers or inform me where I can get a copy of the latest specifications for the test of paving brick adopted by that body?

G. H. STANCHFIELD,
City Engineer, Watertown, Wis.

The report of the committee of the N. B. M. A. on technical investigations, printed in advance of the 1902 convention, contains the complete discussion of the standard tests. The tests themselves will be found in Municipal Engineering, vol. xxii, p. 39. Doubtless the full report can be obtained of T. A. Randall, Secretary N. B. M. A., Indianapolis, Ind.

INFORMATION ABOUT ROCK ASPHALT FOR PAVING.

Will you kindly give me a list of books and pamphlets that are published relating to natural rock asphalt for street paving and the best methods of using it?

H. D. BAKER,
Springfield, Mo.

Literature on the subject of the use of rock asphalt for paving is very scarce. The methods of use depend upon the quality of the deposit and, since the deposits are usually controlled by the companies operating them, information regarding the use of the material can best be obtained from them.

Delano's "Twenty Years' Practical Experience of Natural Asphalt and Mineral Bitumen" (75 cents) is a small book on bituminous limestone and its uses, and there is a short chapter on the rock asphalt streets of Paris in Rockwell's "Roads and Pavements in France" ($1.25).

Several circulars on natural rock asphalt, issued by Gabriel & Schall of New York; W. T. Shields Paving and Construction Company, Philadelphia; H. & A. B. Aveline Sicilian Rock Asphalt Company, Castania, Italy; T. Hugh Boorman, New York, and The Federal Asphalt Company, Chicago, are at hand. Others can doubtless be obtained on application to the producers and users of rock asphalts, whose names can be found in the "Business Directory" in the advertising columns of this magazine under the headings "Asphalt" and "Asphalt Importers."

More information can probably be obtained from the back numbers of Municipal Engineering than from any other source. Among the articles on the various rock asphalts and their uses are the following: "Natural Rock Asphalt vs. Trinidad Pitch Compounds," vol. iv,

p. 167; "French and American Asphalt Pavements Compared," vol. iv, p. 9; "California Asphaltum and Bituminous Rock," vol. ix, p. 10; "Difference Between Asphaltic and California Bituminous Rock Pavements," vol. ix, p. 43; "Natural Rock Asphalt Paving in Europe," vol. ix, p. 80; "Rock Asphalt and Kentucky Asphaltic Sandstone," vol. xi, p. 227; "Differences Between Natural and Artificial Asphalts," vol. xviii, p. 307; "North American Asphalt Deposits," vol. xx, p. 358; "Natural and Artificial Mixtures for Asphalt Pavements," vol. xxi, p. 330; "Asphaltic Sandstone in Missouri," vol. xxi, p. 339; "Imported Asphaltic Mastic," vol. xxii, p. 189; "American Asphalt Rock for Pavements," vol. xxiv, p. 212; "New Methods in Asphalt Paving," vol. xxiv, p. 302.

The annual reports of the United States Geological Survey have much information concerning asphalt and asphalt rock, both native and imported. That for 1901 has an extended description of all the deposits in the United States.

STEEPEST ALLOWABLE GRADE ON VIADUCT.

What do you consider the steepest per cent. of grade allowable for a city viaduct crossing several railroad tracks and streets? C. H. R., Ft. Dodge, Ia.

The allowable maximum gradient will depend upon the character of the traffic passing over the viaduct, the maximum loads carried on wagons over the streets of the city generally, and the material used for the pavement. The subject of grades is discussed in much detail in Byrne's "Highway Construction" ($5) and Baker's "Roads and Pavements" ($5) and refereflce to them is recommended for a careful determination of the gradient for a particular case.

A viaduct is usually a compromise between interests, and it may be necessary in the compromise to reduce the loads which may be carried, or to reduce the speed at which they can be carried, or both. In fact, the passage over the elevation of the viaduct will always reduce the speed, but if the gradient is not too steep the horses will suffer rather than the loads be reduced, so that the expense will come in shorter life of teams rather than in smaller loads. If the approach to the viaduct is very steep both effects will be produced

It is usually assumed that the prohibitory gradient for loads is 10 per cent., and this may be satisfactory for a viaduct mainly used by light traffic with plenty of excess of tractive power for most vehicles and where there are very few heavy loads. It will be very objectionable where there is much traffic such as that to and from freight stations, factories or wholesale houses. A gradient of 6 per cent. in such cases will be as much of a concession to the other interests involved as the traffic should ordinarily be called upon to make. A gradient of 5 or 6 per cent. is considered to be the limit for business streets. A factory or freight station so located that it cannot be reached except over steep gradients has already fixed the customary maximum loads and the gradient of the viaduct can be fixed to correspond with the steep gradients already in use, although it may increase the length of haul over them, but in a city where more nearly level gradients have been in common use, a sudden increase in maximum gradient over a new viaduct with heavy traffic will have a very serious effect in increasing the expense of haulage, and a much larger first cost to reduce the gradient will be justifiable than under the other circumstances described.

The kind of pavement to be used has a strong effect upon the gradient to be used. Macadam and stone blocks can be used on any gradient likely to be adopted, and brick is available for heavy loads up to about 8 per cent., but asphalt in some weather is dangerous for teams going down hill on gradients of 7 or 8 per cent. or more, and impassable for the heaviest loads going up even on a 6 per cent. grade. In ordinary weather it may be satisfactory on a 6 per cent. grade or even a little more, but on a viaduct, which cannot be flanked on a bad day, the gradient, or the kind of pavement, must be fixed for the worst of weather conditions.

Baker states that the gradient for asphalt streets of 5 or 6 per cent. is satisfactory for all but a few days in the year, when it is uncomfortable and even dangerous. It should not be used on a viaduct with more than 3 or 4 per cent. grade unless there is another convenient passage during the hours and for the teams for which the asphalt would be dangerous. With few exceptions the maximum gradient for brick pavements is 7 to 8 per cent. and for viaduct conditions the gradient should be less than the lower figure. Stone blocks, so far as foot-hold is concerned, may be used on any gradient, but their roughness increases the tractive force necessary, so that this reduces the gradient upon which the pavement can be used and again brings it to the neighborhood of 6 or 7 per cent., or near the maximum gradient for a business street above stated. Wooden pavements, if of rec-

tangular blocks laid close, are seldom used on streets of more than 3 to 5 per cent., and as they may occasionally be even more slippery than asphalt they should not be used on a steeper viaduct gradient than that material, unless special sanding is resorted to at the dangerous times.

Of course, special conditions may sometimes override a decision made on the principles here laid down, but they should be very strong for this to be permitted and will often paralyze a district or the viaduct will fail to have the desired stimulating effect upon a district because it has not been able to overcome their detrimental effect.

BOOKS ON ELECTRIC TRACTION LINE CONSTRUCTION.

Will you name the best up-to-date work on traction line construction?

J. A. H., Cincinnati, O.

The development of traction line construction is so rapid and the conditions are as yet so little understood that scarcely any two lines follow the same methods and but few of these have reached the books. Some of the older books give full discussion of most of the problems which arise, but the details must be modified to suit the latest advances.

One of the latest books is Andrews's little "Handbook for Street Railway Engineers" ($1.25), a review of which will be found in Municipal Engineering, vol. xxiii, p. 295. Another book which treats only the civil engineer's problems of track construction is "Brooks's Hand Book of Street Railway Location" ($1.50), a review of the first edition of which will be found in vol. xviii, p. 407.

Among the more complete books, though older, mention may be made of Dawson's "Electric Railways and Tramways" ($12.50), dated 1897, by an Englishman acquainted with both European and American practice. It seems to cover the entire ground, but the latest interurban construction has departed in many respects from his standards. Dawson's "Engineering and Electric Traction Pocket-Book" ($4), considers all the details of electric railway construction. The latest "Pocket Book" is Foster's ($5), which is probably the most up-to-date. Since it covers the field of electrical engineering only a part of it is devoted to railways, and that is restricted to electrical equipment.

Other books are Clark's "Tramways," 1894 ($9); Houston and Kennelly's very elementary "Electric Street Railways" ($1); Herrick's "Practical Electric Railway Handbook" ($3).

BOOKS ON SEWAGE PURIFICATION.

Will you kindly supply me names and numbers of books or journals containing information relating to filters in actual operation for purifying sewage, crude sewage or sewage which has been treated? Likewise I wish to secure literature on practical construction and operation of septic tanks. I will order a somewhat large supply of literature on these subjects.

W. J. ATKINSON,
Acting Chief Engineer, Zion City, Ill.

Rafter and Baker's "Sewage Disposal in the United States" ($6) gives descriptions of works in this country existing prior to 1894, and accounts of the various methods of purifying sewage, including irrigation and intermittent filtration. at Pullman, Ill., and South Framingham, Mass.; intermittent filtration at Medfield, Mass.; Marlborough, Mass.; School for Feeble Minded, Gardner, Mass.; Summit, N. J., and Leadville, Col. Some of these have been materially modified in later years.

Barwise's "The Purification of Sewage" ($2) is a small English book giving three or four chapters, about 40 pages, to the subjects of filtration and septic tanks.

Rideal's "Sewage and the Bacterial Purification of Sewage" ($3.50) is another English book giving much fuller treatment to these subjects and descriptions of various processes used and discussed in England. It is perhaps the best book now obtainable which treats of the modern methods of sewage purification.

Moore's "Sanitary Engineering" ($10) gives liberal space to sewage purification. It is reviewed in Municipal Engineering, vol. xxiii, p. 294.

Descriptions of some recent plants showing plans and views will be found in Municipal Engineering. The plant at Liberty, N. Y., is shown in vol. xxi, p. 1. That at Champaign, Ill., is described in vol. xvi, pp. 158 and 176. That at Vancouver, B. C., is described and drawings are given in vol. xxii, p. 208. Residential septic tanks are described in vol. xxiii, p. 355. The plant at Glencoe, Ill., is shown in vol. xxii, p. 1, that at Clayton, Mo., in vol. xxiii, p. 192, that at Fond du Lac, Wis., in vol. xiii, p. 288, and that at Madison, Wis., in vol. xxi, p. 302. There is a short description of the Brentwood, N. H., sewage disposal works in vol. xviii, p. 30. In vol. xiii, p. 11, is a description of a filtration plant at Altoona, Pa. Articles descriptive of investigations of the septic tank, filtration and contact methods of purification, several of them containing descriptions of English plants, will be found in vol. xiii, p. 362, vol. xvi, pp. 100, 114, 189; vol. xvii, pp. 158, 211, 377; vol. xviii, p. 368; vol. xix, pp. 195, 262, 294;

vol. xx, pp. 163, 223, 226, 257; vol. xxi, pp. 18, 85, 242; vol. xxii, pp. 261, 324, 388; vol. xxiii, pp. 153, 223, 357. Two or three of these articles are derived from the reports of the Connecticut Sewerage Commission, which has issued several illustrated reports on its investigations of sewage purification.

INFORMATION ABOUT THE SEPTIC TANK.

Our city is contemplating a sewer system. Its population is 2,800 and there will be from 10,000 to 20,000 gallons of sewerage in 24 hours. Can you give us information in regard to the maintenance of a septic tank?

HENRY KNEER,
Superintendent of Water Works,
Emmetsburg, Iowa.

Please give us all the information you can regarding a sewage disposal plant and about what the same will cost.

D. W. NORTON & CO.,
Vincennes, Ind.

Reference may be made to the answer to M. W. J. Atkinson's question in this department this month, headed "Books on Sewage Purification."

Iowa State College, Ames, Iowa, has published five bulletins regarding the experiments on sewage purification which have been made in Iowa during the past five years, and copies of these bulletins can be obtained from Professor A. Marston.

COST OF SMALL STONE DAM.

Our corporation owns the electric lighting plant, the power used being part water and part steam. Our old wooden dam will have to be rebuilt this year. I believe it would pay us to put in a stone or concrete dam. In your question department will you please give me an estimate on a dam 150 feet long and 15 feet high, no gates being needed. We would expect to build of rubble masonry. About one-half of the foundation would be on rock bottom, the balance would have to be excavated in gravel to obtain a good foundation. How wide should our dam be at the base and should much stone be used on the top in large square blocks? Large ice would not bother us much, as there are two dams above ours that break it up, besides, usually the ice rots out in the upper pond, which is mostly overflowed land.

J. BRUCE PAYNE,
Municipal Councillor,
Granby, P. Q.

The form of section and exact dimensions of the dam can be determined only after expert examination of the conditions of foundation, stream bed, depth of flood water over dam, ice, etc., but the amount of masonry to be used would probably not vary much from that in a dam 12 feet wide on the bottom and 5 feet on top where it is 15 feet high. The amount of excavation in the rock to give good footbold and in the gravel to good foundation would materially affect the total amount of masonry and its cost. Roughly, the cost of the dam would probably be between $2,000 and $3,000, though special difficulties might easily increase the cost beyond the latter figure. The dam should have a coping of heavy stone or concrete, which will be able to keep its place under any probable action of ice or drift.

Whether the stone or concrete dam would be more economical than a timber dam could be determined by comparing the cost of the two for a term of years, offsetting the renewals of the timber dam against the greater interest charged for the stone dam and taking into account also the time when the plant must be run by steam during the construction and reconstruction of the dam.

The fee of a competent engineer for designing the dam can easily be saved in the greater safety and economy of the structure.

HOW TO DESIGN A SYPHON.

At our water works we have put down a well 20 feet in diameter and 41 feet deep on the east side of a pond. Our pump house is on the west of the pond and 400 feet distant, and is by an old well 30 feet deep and 15 feet in diameter and about 60 feet below the new one. I want to syphon the water in the new well into the old well. What must be the difference in level of the two wells and how must the syphon be made? Where should the gates be put?

A. W. W.,
Horton, Kas.

The difference in water level of the two wells gives rise to the force which will transfer water from the one to the other. The location of the highest point in the syphon also has considerable effect and it must not be above the hight of a column of water in a vacuum tube for your latitude and elevation above sea level, probably not more than 25 feet above the lowest level of water in the higher well. The water will, of course, flow from the higher well to the lower one when the air is exhausted from the syphon.

If the two bodies of water were connected by a straight pipe the flow could be computed for a given fall, and size and length of pipe. The capacity of syphons seems to be somewhat less than that of the straight pipe. Reports of capacities which are at hand vary from "about the same as a straight pipe" to 37 per cent. less.

The syphon should be laid so that there

will be but one summit in it and that must be supplied with an air chamber and connected with an air pump or steam ejector or an arrangement for filling the air space with water at as frequent intervals as are necessary. In the latter case gates will be necessary for both ends of the pipe preferably below the water surfaces. The syphon can be started by closing these gates and filling the pipe with water at the high point, or by pumping out the air in it. Variations in the slope of the effluent leg of the syphon seems to give rise to difficulties in operation, especially a vertical end, unless it dips under the water in the lower well.

COST OF WOODEN WATER PIPE.

I find in the question department, vol. xxiii, p. 261, that 12-inch wooden pipe cost 42 cents per foot laid in Chicago under 25 feet head and 85 cents for 200 feet head. I cannot get anyone here to believe this. They say the iron alone is worth that amount. What explanation can you make?

A. L. RUSSELL,
Port Arthur, Ont.

As stated on the page referred to the figures given are from a paper by A. L. Adams on "Stave Pipe, Its Economic Design and the Economy of Its Use," which will be found in the "Transactions of the American Society of Civil Engineers," vol xli, p. 27. This paper is used as the basis of the discussion on the subject of wooden water pipe in the text books which have appeared since 1899. The best method of explaining the figures is to give Mr. Adams's description of the table. He says:

"Variability in market quotations on materials, freight rates, wages, the effect of geographical location on these, the conditions affecting haul and the manner of executing the work make it impossible to deduce an accurate comparison of cost which would admit of general application. For present purposes, however, it is not necessary to attempt more than to convey a general idea of the order of the respective cost of the three classes of pipe considered, at the terminal points designated (Chicago and San Francisco). For this purpose tables 8 and 9 have been prepared with considerable care.

"It is assumed that the stave pipe is designed in accordance with the formulas previously deduced, an assumption which somewhat increases the cost, particularly for light pressures, above that which would result were the bands spaced in accordance with the formula more commonly used.

"The mill price for sheet steel is taken at from 1.60 for No. 14 plate to 1.25 for thicknesses greater than No. 8. The prices assumed per ton for cast pipe are $19 at Chicago and $26 at San Francisco.

"The figures are supposed to include only the principal common items of expense, with no profit to the contractor. They are, therefore, perhaps in every case, somewhat below probable cost, and are intended for use by way of comparison only."

The table headings state that the cost includes laying but does not include hauling.

Aside from Mr. Adams's statements very little has been published regarding the cost of wooden stave pipe. In a paper by him in vol. xxxvi, Transactions of the American Society of Civil Engineers, he states that the contract price of the 18-inch wooden stave pipe of the Astoria Water Works under head of 150 feet was 90.33 cents a foot, including all appurtenances, and 76 cents excluding such appurtenances. The San Francisco price for 18-inch pipe, according to the table from which the results under question were derived, under 100 feet head is 96 cents and under 200 feet head is $1.47. The Astoria pipe is evidently cheaper than the tabular cost, even before contractors' profit, estimated at 12 to 15 per cent., and hauling are added.

Some 36-inch pipe for the West Side Mining Association in Colorado under 90 feet head cost $2.25 per foot laid, with a maintenance guaranty for 8 months, as against the tabular San Francisco price of $1.83 for 100 feet head, to which hauling and contractor's profit must be added. This is reported in Engineering News, page 66, July 30, 1896.

A table giving still lower costs for wooden pipe of 16 to 60 inches diameter than Mr. Adams's table will be found in Engineering News, page 334, May 21, 1896; also on page 488, May 12, 1892, the list prices of a pipe making company are given which are very nearly the same without allowance for profit and haul.

In the Journal of the Association of Engineering Societies, p. 253, November, 1898, will be found a good description by D. C. Henny of an Australian pipe line with over 300 miles of 30-inch wooden pipe, which cost from $1.70 for low heads to $3.90 for 200 feet head, as compared with 83 cents and $2.23 in the Adams table. Adding haul and 15 per cent. profit and making allowance for the great difference in conditions will bring the figures nearer together.

However, as shown by the prices for iron and steel quoted from Mr. Adams, the cost of materials is now much greater than at the time the table was prepared,

and, while the figures in it are shown by the other date to be well chosen for the time, they must be increased somewhat to suit the present cost of material and labor.

The above reply was sent to Mr. Russell when prepared and he has responded with the information that a preliminary estimate made by a consulting engineer for stave pipe with ordinary iron bands laid three feet deep in sandy soil was $1.30, and for iron pipe was $2 a foot in Port Arthur. The contract has been let the Pacific Coast Pipe Company of Spokane, for seven miles of twelve-inch bound stave pipe spiral wound with galvanized iron wire, duty and freight paid, at 78 cents a foot, the head being fifteen feet per mile or 105 feet in all. When contractor's profit and hauling are added to the Chicago prices given by Mr. Adams, they are little more than half the preliminary estimates above, but are less than 10 per cent. below the contract price. The difference may be accounted for in freight and duty.

NUMBER OF FIRE HYDRANTS.

We remember seeing several articles in your magazine, saying that it was cheaper for a city to pay on fire hydrants placed close together, say every block, than to keep up the extra hose necessary, where the fire plugs were placed several blocks apart, and at the same time get better efficiency. Can you tell us where to find them and where we can get other information on this point?

VICKSBURG WATER COMPANY,
Vicksburg, Miss.

There are several articles in Municipal Engineering from which valuable information on this question can be derived. The general principles upon which hydrant rentals should be determined are considered in an article on "Hydrant Rental" in vol. xxiv, p. 182. The propriety of the insertion of intermediate hydrants, placed after the number of hydrants decided upon for general purposes have been distributed is considered in an editorial on "The Determination of an Equitable Hydrant Rental" in vol. xxiv, p. 189. These hydrants should be located between those already placed, in districts where several streams are likely to be needed, and, being simply for the convenience of the city and to aid the water company in supplying water at the best pressure possible, may be charged for at a much less rate than the regular hydrants. In some cases all the expense of placing these hydrants is paid by the city and no additional charge is made by the water company. In other cases they are put in by the company and a small annual rental is charged, say from $1 to $10 per annum. If the regular hydrant rental is fixed according to the principles proposed in the articles referred to, it should be easy to fix a fair rate for these intermediate hydrants, based upon the annual cost of maintaining them, including interest and depreciation, or upon the annual saving to the city by their use or both. Some assistance in this can be obtained from a paper on "Fire Streams" in vol. xxiii, p. 269, which shows the losses in water pressure due to length of hose, and from one on "Hydrants, Meters and Wastes" in vol. xxiii, p. 185, in which the best location for hydrants is considered and a comparison of the cost of extra hydrants and of fire hose is made, showing that the first cost of the hydrant is less than the first cost of a 50-foot length of first-class hose and that the hydrant is good for 50 years or more with little or no repair, while the hose must be replaced every five years or so. Some more data will be found in this department of the magazine in vol. xxi, p. 401. Mr. John R. Freeman discussed the subject at length in a paper before the New England Water Works Association, copious extracts from which will be found in Goodell's "Water Works for Small Cities and Towns" ($2).

These intermediate hydrants are needed only in the business or factory districts of a city and should be considered independently of any contract or rule fixing the number of feet of main for which a hydrant is to be set and the charge per hydrant. Being simply conveniences they are on a different basis and should have a special rate and a special contract provision.

CITIES USING ELECTRIC WATER SUPPLY PUMPS.

Please give me the names of towns which pump water for their water works system by electrically driven pumps, supplying towns of 10,000 to 25,000 inhabitants.

E. C. DEAL, Brazil, Ind.

There are probably no water supplies for cities of this size which are pumped by electric power. Presumably electric power for pumping is more expensive than steam power if the supply is great enough to require constant operation of a pumping station. The economy of electric pumping is in small stations where a few hours' pumping a day is sufficient to maintain the supply and the constant attention of two or more men required by a steam plant even if run only part of the time adds greatly to the cost of pumping. When the attention required is reduced to turning on the current and looking after the maintenance and repairs of the dynamo and pump, and the

former can even be made automatic, the saving of wages as well as of fuel and other materials takes off a large part of the cost of pumping and makes the electric method more economical.

The electrical pumping plant at Dekalb, Ill., population about 5,500, is described in vol. xxi, p. 379, and the saving in the change from steam power is clearly shown. The water and light plant at Lawrenceville, Ill., population 1,500, are described in vol. xxii, p. 7.

Can our readers give examples of the use of electric power in pumping larger quantities of water under the conditions of a public water supply?

WHO SHALL PAY FOR WATER METERS?

The franchise obtained from the city when our water plant was built provides in broad terms that the water company may make all needful rules governing the consumption of water. It has rules stating that the water company can compel any of its patrons to put in meters at the discretion of the manager. Some are claiming it has no right to compel its patrons to put in meters at their own cost, and that if it wants them to use meters it must furnish them.

M. O. C., Vicksburg, Miss.

No decisions are at hand deciding the exact question as stated. There are many which agree practically in stating that it is a matter of franchise, ordinance and contract. Some decisions which will throw some light upon the attitude of the courts may be cited.

In the case of W. A. Collier against the Artesian Water Company at Memphis, Tenn., reported in Municipal Engineering, vol. xxii, p. 45, Chancellor Heiskell sustained the right of the company to collect its charges by meter, stating that if they are unjust and extortionate the consumer can recover by a suit at law.

A superior court in Pennsylvania, in a case from Lancaster, reported in vol. xiv, p. 283, sustains the right of the city to charge meter rates for certain classes of consumers and not for others on the ground that the rates are matters of contract between the water plant and the consumers, subject only to the requirement that they shall be reasonable and as nearly equal as possible. In this case the regulations provided "that whenever a consumer prefers to pay the cost of such meter as shall be approved by the superintendent of water works, together with the cost of putting in and of its maintenance, rather than pay schedule rates, a meter shall be put in, provided that in no case where a meter is used shall the annual charge be less than $10." The plaintiff was forced by the city to put in the meter and refused to pay meter bills, claiming the right to pay under former schedule rates. The decision is clearly in favor of the water commissioners. The decisions of the lower court in two such cases, sustaining the right to put in the meters, are reported in vol. xiii, p. 397. One in California denying the right to force the insertion of a meter is reported in the same article.

A minimum meter rate, which often serves as a meter rental is legal in Wisconsin, according to the supreme court in the case of Vits against the Water Works Company of Manitowoc, reported in vol. xxii, p. 409.

In vol. xvii, p. 207, C. W. Tooke, Professor of Law in the University of Illinois, discusses the question of the right of a water works plant to compel customers to use meters. While he does not touch the question of who shall pay for the meter, he puts the entire subject on the contract basis, stating that "a city in furnishing water is not acting in a public capacity but in a private capacity and has the same right to make reasonable charges therefor that a private corporation has when serving the public." Even when the statutes require uniformity in rates as in Ohio, he says, "different method of making charges may be imposed as a penalty for the abuse of water privileges."

In vol. xxiii, p. 263, is reported a decision by the New York supreme court refusing an injunction to prevent the collection of a gas meter rent.

The question, "Who Should Own the Water, the Company or Departments, or the Consumer?" is discussed by J. H. Decker in the proceedings of the tenth annual meeting of the American Water Works Association, p. 125 (50 cents). He quotes from many engineers, chiefs of bureaus, superintendents, registrars and secretaries, giving almost all shades of opinion on the subject, with strong arguments on all sides

While the writer believes the greater weight of argument is in favor of the ownership and maintenance of meters by the water plant, with such addition to rates for water used as shall pay the charges for interest and depreciation and maintenance, as well as cost of reading and recording, he finds no general prohibition of the requirement that the consumer purchase the meter. Under some franchises and some state laws this prohibition may be in force, but no examples are at hand. In some cases the consumer is required to make a deposit equal to

the cost of the meter, which is returned when the meter is returned in good condition at the close of the contract for water service. The ordinary deterioration of the meter is probably taken care of in the meter rate for water service in such cases. A case of this sort in Des Moines, Ia., is reported in vol. xi, p. 325.

MUNICIPAL MATTERS IN COURT

Higher Courts—Rights of Foreign Water Company in City—Salt Lake City Plant Sale—New Albany Combination Enjoined—Louisville Sprinkling Water Case—Shutting Off Connections—Water-Works Appraisal—Paving Competition—Reassessment Law—Railway Must Pave Tracks—Chicago Street Railway Receiver—Civil Service Decision—Court Appointmeni of City Officials—St. Paul Lighting Case—Municipal Lighting Enjoined—Merger Case.

Abstracts of Decisions in the Higher Courts.

Advertisement for Bids and Plans—An advertisement for proposals for constructing a bridge requiring the bidder to furnish with his proposal a plan showing the kind and style of bridge that he intends to construct, instead of requiring him to bid on a particular style of bridge is not illegal; there being no provision in the city charter requiring the bids to be let to the lowest bidder. Kundinger vs. City of Saginaw et al., 93 N. W. Rep. (Mich.) 914.

Barriers Around Defects in Sidewalk—Where barriers, erected around a pile of stones on a sidewalk under authority of the superintendent of streets, do not inclose the whole walk, but leave a part unobstructed, and a pedestrian is injured by falling over the stones while walking along the unobstructed part, the partial inclosure by such barriers does not relieve the city from liability for the injuries. Leonard vs. City of Boston, 93 N. W. Rep. (Mass.) 596.

Carpet Across Sidewalk—Conceding that the proprietor of a hotel had the right to place a carpet and canopy across from the hotel entrance to the curb, it was his duty to exercise reasonable care and diligence that travelers in the exercise of due care were not injured thereby. Morris vs. Whipple et al., 65 N. E. Rep (Mass.) 199.

Change of Street Grade—When a city is about to change the grade of a street on which a building stands, the fact that the owner of the building secures such a modification of the proposed change as will result in less injury to him does not bar his right to damages for the change actually made. Klaus vs. Mayor, etc., of Jersey City, 54 At. Rep. (N. J.) 220.

"Contiguous" Lots—As originally platted, a corner lot and the next two inside lots fronted on a street to the north, but afterwards they were divided, by conveyances, into north and south halves, fronting on the cross-street along which the corner lot originally ran; and the south half was occupied as a residence, distinct from the north half. Held, that the south half could not be subjected to a special tax for the improvement of the street to the north, authorized to be levied on property contiguous thereto. Langlois vs. Cameron et al., 66 N. E. Rep. (Ill.) 332.

Failure to Complete Contract.—A contractor failing to construct city waterworks according to his contract is entitled to recover the value of the work done by him, the benefits of which the city has accepted, less the payments made to him on account of the contract, added to the amount reasonably paid by th city to complete the works. City of Sherman vs Connor et al., 72 S. W. Rep. (Tex.) 228.

Excavations in Street—Ordinance.—An ordinance making it a misdemeanor for any person to leave an excavation in a highway unfenced or insecurely covered does not apply to the city, nor render the city's failure to comply therewith negligence per se. Browne vs. Bachman et al., 72 S W. Rep. (Tex.) 622.

Live Wire—Notice to City.—In an action to recover for injuries sustained by a boy from contact with a live telephone wire used in the police service of a city, and which had fallen and had become charged from a feed wire of the electric

railway, the case is for the jury where the break was known to the police within an hour after it occurred, and it was also known that the wire was in close proximity to other wires carrying dangerous currents of electricity. Herron vs. City of Pittsburg, 54 At. Rep. (Pa.) 311.

Lots on Each Side of Street.—Under Burns' Rev. St. 1902, sections 4,290, 4,293, 4,294, providing that owners of lots bordering on a street or alley which has been improved shall be liable for their proportion of the costs in the ratio of the front line of their lots to the whole improved line, and that the engineer shall report the amount of cost for the improvement due on each lot bordering on the street, whereupon the common council shall assess against the several lots the amount due on account of the improvement, lots on both sides of a street must be assessed for an improvement lying entirely on one side of the center of the street. Klein vs. Nugent Gravel Co., 66 N. E. Rep. (Ind.) 486.

Mandatory Statute—A city obtained from the general assembly a resolution that the common council be "empowered to issue bonds for the purchase of lands and for the erection of a building for the city, * * * which building shall be erected under the control of a committee" consisting of certain persons. Held, that the resolution was merely permissive as to the erection of the building, etc., and not mandatory. Staples vs. City of Bridgeport et al., 54 At. Rep. (Conn.) 194.

Paving Contract Repairs.—A paving contract required the contractor to maintain pavement in good condition to the satisfaction of the commissioner of public works for fifteen years from its acceptance; that the entire work should be done to the satisfaction of the commissioner of public works, and in accordance with the specifications. A specification provided that if, during the fifteen years from the date of acceptance, the work should, in the opinion of the commissioner, require repairs, he should notify the contractor to make them by a written notice, and that the contractor should immediately complete the repairs to the satisfaction of the commissioner. Held, to require the contractor to make only such repairs as he should be required to make under a written notice. O'Keeffe vs. City of New York, 66 N. E. Rep (N. Y.) 194.

Sidewalk Special Assessment—Under Burns' Rev. St., secs, 4,396, 4,397, providing that if a lot owner fails to construct a sidewalk within the time prescribed by ordinance the marshal shall let out the work to the lowest bidder, and the cost shall be collected by proceedings to foreclose a lien on the property, where the marshal, having failed to secure any bid for constructing a sidewalk, was ordered by the trustees to do the work, the cost cannot be collected of the lot-owners personally or imposed as a lien on the lots. The lot-owners were not estopped to object to paying the cost of such sidewalk by the fact that they saw it constructed by the marshal, and made no objection thereto. Town of Clay City vs. Bryson et al., 66 N. E. Rep. (Ind.) 498.

Street Improvement Ordinance—An ordinance which provided for the grading of a street "full width to the curb grade" was not void in that it did not designate what part was sidewalk, the cost of which should be borne by the owners of fronting lots, and which part was carriage way, the cost of which should be borne by the owners of lots in the contiguous quarters of squares, the construction of sidewalks not having been contemplated. Burghard et al. vs. Fitch et al., 72 S. W. Rep. (Ky.) 778.

Suit to Recover for Street Improvement.—Where a special assessment made for street paving was illegal, but the work was done ,and the city subsequently paid the claim of the contractor therefor, it may maintain a suit in equity against an abutting property owner to recover for the improvement in front of his property on a quantum meruit, under sections 478, 479, Code Iowa, 1873; and the defendant cannot set up to defeat such recovery any technical irregularity in the assessment or proceedings, or that the city had no authority to pay the claim of the contractor. City of Davenport vs. Allen et al., 120 Fed. Rep. (U. S.) 172.

Validity of Contract.—Where municipal authorities can only let a contract for public work to the lowest bidder after advertising for bids, the specifications must be so framed as to secure fair competition upon equal terms to all bidders. Any contract entered into with the best bidder, containing substantial provisions beneficial to him which were not included in the specifications, is void, for it is not the contract offered to the lowest bidder by the advertisement. Diamond vs. City of Mankato et al., 993 N. W. Rep. (Minn.) 911.

Right of Company to Lay Pipes Across Streets on Granted Railroad Right-of-Way.

Judge Nash rendered a decision April 11 in the case of the Rochester and Lake Ontario Water Company vs. the city of Rochester, N. Y., making permanent the temporary injunction made against the

city restraining it from interfering with the company laying its pipes across the streets intersected by the New York Central Railroad. Judge Nash declares that the bill rushed through the legislature by Mayor Rodenbeck is of no value because it is an amendment to that part of the city charter relating to the municipal water supply, and has nothing to do with the operation of such a water company as the plaintiff in this action has.

* * * The provisions of the section of the statute under which the company is acting are peremptory. * * * It is difficult to say by what power or authority the city has any right to interfere with the work of the plaintiff in laying its pipes across the streets on the right-of-way it has acquired.

The plaintiff is a corporation duly incorporated in the manner provided by the statute. Its certificate of incorporation states that the required permits of the villages and towns it proposes to supply with water have been granted. And annexed to its certificate are the permits signed as required by the statute. It has made the examinations and surveys for its proposed water works, necessary to determine the proper location thereof. It has obtained by grant the right to lay its pipes from the west to the east line of the city, on the lands of the railroad company. There is nothing further required of the plaintiff to entitle it to exercise its right to lay its pipes on the proposed line of its water works.

The police power of the city over its streets is invoked, and it is claimed that the consent of the city authorities, which it is plain would be refused, must be obtained by the plaintiff before it can be permitted to lay its pipes at street crossings. All corporate powers come from the state, either directly by an act of the legislature granting the franchise, or by or under delegated authority, as in the case of municipalities empowered to exercise certain rights of franchises or to grant them to be employed within the limits of the municipal authority. It would be a sufficient answer doubtless to the claim of the city to exercise its police powers in derogation of the right of the plaintiff which is the subject of a direct grant from the state, to say, that the exercise of every right delegated to a municipality is subordinate to a direct grant by the state, whether before or after the delegated power is conferred. But the power to enact ordinances for the protection of its streets is simply to enable the city to prevent lawless interference with or injury to its property, pavements, water pipes and sewers, or interference with the public use of the streets. This is guarded against in the grant of the plaintiff, the exercise of which is subject to liability for all damages done. Whatever may have been the purpose of procuring the passage of the recent act amending the city charter, the intention of the legislature must be ascertained from the language of the act itself.

Applying the same rule of statutory construction of the language of the recent amendment to the city charter (Chap. 59, laws of 1903) it does not in any manner conflict with the right of the plaintiff to lay its pipes under the provisions of the corporations law. The section of the charter which the act amends is 157. The scope of this section of the charter is to define the power of the city over streets, etc., to extend water works.

It empowers the commissioner of public works of the city to enter upon the streets for the purpose of laying down pipes for the conveyance of water, or conveying water, or constructing, repairing altering, maintaining or extending any portion of the water works of the city. The amendment at the end of the section reads:

"No other person or corporation shall enter upon or excavate any road, street, highway or public place in the city of Rochester, for the purpose of laying down pipes for the conveyance of water, without the permission of the Common Council."

The language of the amendment itself defines its purpose. It is to prevent any other person or corporation from entering upon or excavating any street of the city for the purpose of laying down pipes for the conveyance of water; conveyance of water for the purpose for which the commissioner of public works is authorized to lay pipes. Read in connection with the direct grant of the state to the water works companies to lay pipes for the purpose of supplying other municipalities with water the language of the amendment can have no other force or effect. Full effect may thus be given to the purpose and spirit of both acts of the legislature.

The court then discussed the question of the power of the legislature to pass an act which would have the effect to take away the right of the plaintiff to lay its pipes for the purpose of supplying water to the municipalities and the railroad companies in the performance of its contract. It recalls that the company has acquired a franchise for which it paid the organization tax; this franchise is property; it has contracts with the several villages and towns to supply the inhabitants and manufacturing plants therein with water; these contracts are property; it has a contract to supply the railroad company with water; it also is property; it has acquired an easement to lay its water mains on the railroad right of way, also a valuable property, the deprivation or impairment of the value of which would be in violation of the provisions of both the state and federal constitutions. The city of Rochester owns and operates a municipal water plant which supplies water to its inhabitants for domestic and municipal purposes at a cost of about $11,000,000 and the defendant urges that by the construction of its water works the plaintiff would enter into competition with the city in supplying its

inhabitants with water. Judge Nash declares that the plaintiff is not seeking to lay its water mains for any such purpose and cannot without first acquiring the franchise from the city. It can lay its pipes across the streets for the purpose of conveying water to the adjoining municipalities. It will not be enabled to supply water to the city except in a very limited way to the occupants of lands contiguous to the right of way of the railroad company. If it has that right it cannot be interfered with. If it has not it may be restrained.

This is not the question, however. The defendant urges that the question is raised because of the contract of the plaintiff to supply water to the New York Central & Hudson River Railroad Company, now furnished by the city at a rental of from $18,000 to $20,000 a year. The defendant attacks the right of the plaintiff to supply the railroad company with water for the reason that the city of Rochester has the right to insist that the plaintiff shall not become its competitor. The court points out that the railroad company has the right not only to supply itself with water by purchase as an incident to the operation of its road but by express provision of law it may, by condemnation proceedings, acquire the right to take and convey water in aqueducts or pipes to its roads, that having the right to lay its pipes on its own lines for the conveyance of water for its use it has the right to contract with another to do for it what it can do for itself.

The court concludes as follows:

The plaintiff should have judgment as demanded in the complaint, giving it the right to lay its water pipes at the street crossings, without interference of the defendant or its agents or servants except so far as may be necessary to protect the property of the city and prevent inconvenience to the public.

Salt Lake City Water and Power Company's Plant to Be Sold.

A decree in the district court has been rendered by Judge Wm. C. Hall ordering the sale of the property and tangible interests of the Salt Lake City Water and Electrical Power Company to satisfy judgment, to the amount of about $500,000 which had been secured against the company. Joseph Goehegan was appointed receiver for the company several months ago to look after the interests of those who had filed claims against it. The court decided that all the liens that were filed against the defendant in accordance with the statute are in due form and that all the bondholders are to stand on the same footing. The liens and deeds are to be foreclosed in accordance with the provisions of the law and the proceeds of the sale divided among the lien and bond-holders in accordance with the above rule.

New Albany Water Works Merger Enjoined.

A petition for a rehearing in the New Albany Water Works case was overruled by the United States circuit court at Chicago, April 14. The suit involved the lease of the New Albany water works to the Indiana Water Company, which is composed of the same syndicate of Chicago capitalists who own the majority of the stock of the New Albany water works, and had been enjoined from connecting its pipes with the mains of the New Albany water works. The United States circuit court at Indianapolis decided in favor of the minority stockholders, and the decision was affirmed by the United States court of appeals at Indianapolis. The city of New Albany filed suit, April 22, against the New Albany Water Company to forfeit its charter. The city asked that a receiver be appointed and asks judgment for $20,000 for the forfeiture of one year's water rent. The suit is based on the claim that the company has entered into an illegal combination with the Indiana Water Company to destroy competition and has failed to give the city sufficient water for fire protection.

Louisville Water Company Required to Furnish Water to Louisville Sprinkling Company.

Judge Evans of the United States circuit court sustained Robert Weimer of the Louisville Sprinkling Company by granting a mandatory injunction to compel the Louisville Water Company to furnish him with water. The court held that the equitable law against undue discrimination in such cases has been violated by the Louisville Water Company in favor of the Louisville Tramway Sprinkling Company, and that the complainant is entitled to the relief sought. The only condition specified in the opinion is that if at any time it should become impossible for the defendant to fulfill its contract with the Louisville Sprinkling Company, the order may be modified to suit the exigencies of the occasion.

The Louisville Water Company filed a petition for an appeal and assignment of errors April 6, and Judge Evans entered an order granting the appeal. The case will now go to the United States circuit court of appeals at Cincinnati for ad-

judication. The seven errors alleged to have been committed by the court are:

1. In holding that Weimer was entitled to be furnished with water even though he did not comply with the rules of the Louisville Water Company, made for the conduct of their business.

2. In holding that the Louisville Water Company is required to furnish water the plaintiff to sprinkle streets without regard to the fact that such sprinkling could be obtained from a company other than Weimer's.

3. In holding that the defendant is required to furnish water to applicants generally without regard for the welfare of the company or of the city generally.

4. In ordering a mandatory injunction enjoining the Louisville Water Company from refusing to furnish Weimer with water during the spring, summer and fall of 1903.

5. In requiring the defendant to restore to and not remove the meters from the tanks of the Louisville Sprinkling Company by which water received and used by the plaintiff is measured.

6. In requiring the Louisville Water Company to give the plaintiff access to and the use of the post hydrants during the spring, summer and fall of 1903.

7. In ordering the Louisville Water Company to refrain from removing meters from the tanks of the Louisville Sprinkling Company during the spring, summer and fall of 1903 except for the purpose of testing or repairing them.

Nearly all the stock of the Louisville Water Company is owned by the city of Louisville, Ky., so that it is to all intents and purposes a municipal plant.

When May Water Connection Be Shut Off.

A. L. Cole asked for an injunction to restrain the borough of Du Bois, Pa., from shutting off his supply of water, after his refusal to pay his quarter's bill on the ground that he was overcharged for one month the sum of 97 cents. He claimed defective meter, bad and irregular supply of water. Judge Cyrus Gordon of the Clearfield County Court of Common Pleas dissolved the preliminary injunction on March 16, and entered judgment for the borough on the amount of the bill and penalties. The following extracts are taken from his decision:

The question must be disposed of solely from a consideration of the quantity of water used. Its bad quality and the irregularity with which it was supplied by the borough are immaterial questions. The uncontradicted evidence shows that while the water supply in 1902 was defective and variable, both as to quality and quantity, it as conclusively shows that the failure was unavoidable—that the borough had done everything possible to secure a good supply of water, but was unable to do so. Further, plaintiff was familiar with the condition of the water supply, both as to quality and quantity, which was the same in October, 1902, as it was at the time his contract for water was entered into, and always had been.

1. The rules adopted by the borough regulating the supply of water to its inhabitants are reasonable and just. 2. There is no evidence of bad faith or partiality exercised in the dealings of the borough officials with the plaintiff. Water was supplied to him on the same terms and conditions as to other consumers. 3. The evidence shows that the meter in plaintiff's house by which the water used was measured was the best in the market, and there is no allegation it was not in good order at any time. The evidence shows that no meter will measure water with strict accuracy, but that they never show an excess, and that when a failure exists it is always against the interest of the water company. It is true a meter will be caused to run by the passage of air through it the same as water, but the evidence shows that they run backward as well as forward and that experience teaches there is little likelihood of injustice being done a consumer on this account. As most meters are alike in this regard, and if it be impossible to measure the water with absolute accuracy, and their use is the only way known to regulate the consumption of the water and measure the liability of the consumer thereof, no charge on account of the imperfection and possibility of inaccuracy can be made against the defendant borough. 4. There is no positive evidence that the water bill of October, 1902, is unjust. It is confined to the opinion of the plaintiff that it must be so because larger than the bills were for other months before and after, while the supply of water was small and considerably less than during said months. But in view of the fact that water might have escaped unusued and unknown by him, his testimony, regardless of its sincerity and his truthfulness as a witness, taken in connection with the evidence as to the condition and accurate measurement of water by the meter at all other times, does not sufficiently manifest injustice in the demand made to justify restraint of the acts of the borough by injunction. In view of the accurate work of the meter at all other times, the presumption is strong that its report as to the water consumed during the month in question was truthful. It was on the ground all the time, was a competent and well informed witness, with its testimony never before impeached.

Further, no defense is made to the bills for November and December, and to $1 of that of October, 1902, and yet these were not paid. The borough had the right to cut off the water on that account. It is true plaintiff exhibited to the water commissioner a willingness to pay the $3, but before appealing to an equity court for relief he should have paid the amount he admitted was due. This, however, is immaterial in view of the position taken as to the entire bill for the month of October.

We are indebted to W. T. Smith, Commissioner of Water, for the text of the decision.

Valparaiso, Ind., Water Works Appraisal.

An opinion was handed down by Judge W. C. McMahan at Crown Point, Ind., recently in the case of the city of Valparaiso vs. the Vaparaiso City Water Company. The suit was brought to determine the value of the plant and fix the price which the city should pay for it. In its complaint the city alleges the granting of a fifty-year franchise, the acceptance of the same, the completion of the water plant, its final acceptance by the city in accordance with the franchise. It alleges further that at the expiration of fifteen years from the completion of the plant the city gave notice in writing that it desired to purchase the plant, and selected a hydraulic engineer to act, with one to be chosen by the water company in fixing the value of the plant, but the company refused to select any person to act with engineer chosen by the city to fix such value. Only four witnesses testified upon the subject of value—Messrs. Mead and Alvord, hydraulic engineers of Chicago, and Messrs. Smith and Holmes. Mr. Smith said that the cost to reproduce the plant, without allowing anything for depreciation, would indicate that the physical value of the plant is $119,693. He then capitalizes the plant on the theory that the net income is $15,000 a year and fixes the total value of the plant at $250,000 and deducts for the value of franchise $90,000, leaving the physical and going value $160,000. After making an examination of the plant Engineers Mead and Alvord gave the value as follows:

Cost to reproduce	$89,617	
Depreciation	33,221	
Physical value	56,396	
Going value	26,710—	
Present physical and going value		$83,106
To this I think there should be added for meters	750	
On intake	2,850—	
		3,600
Making the price which the city should pay		$86,706

Judge McMahan said that Section II of the ordinance provides that the value which the city shall pay shall be fixed by three disinterested hydraulic engineers; one to be chosen by the city, one by the owners of the water works, and the third to be selected by the two thus chosen; the appraisement fixed by such engineers, or in the event they do not all agree, the appraisement fixed by any two of them, shall be conclusive and binding upon the parties as the purchase price of the water-works. The defendant Water Company by its acceptance of said franchise became morally, if not legally, bound by these provisions, and having refused to live up to the terms of the contract, thus forcing the city to go into court, and encounter the usual delays and possible appeals attending a law suit, are not in a position to complain if the court should accept the value given by the two engineers as the value which the city should pay.

Paving Competition Free in Minnesota.

The Supreme Court of Minnesota handed down a decision about April 15 holding that where a contract must be let to the lowest bidder for any public work there must be the fullest and freest competition. The court holds that there is asphaltum other than Bermudez and Pitch Lake asphalt equally good for paving purposes, and that there are many persons seeking to do work with them.

Wisconsin Reassessment Law Is Constitutional.

The Wisconsin Supreme Court handed down a decision March 20 holding that the reassessment law enacted by the legislature of 1901 was constitutional and that the reassessments made thereunder were valid. The decision was rendered in the case of Schintgen vs. the City of LaCrosse. The lower court was reversed on the ground that the circuit judge, before whom the case was tried, failed to put in the findings of fact that the brick pavement was laid on a concrete foundation. This was a mere technicality and will relieve the plaintiff temporarily, but a reassessment can and probably will be made against him. Many of the property-owners refused to pay their taxes for their special assessments and permitted the same to go to tax sale. These property-owners will be compelled to pay 15 per cent. per annum on the certificates outstanding in order to redeem the tax certificates.

Binghamton Street Railroad Must Pay for Paving Tracks.

A decision has been rendered by Justice Sewell in the Oak street paving case at Binghamton, N. Y., in the case of the property-owners against the Binghamton Railroad company. Justice Sewell permanently enjoins the Common Council

from collecting from the owners of property abutting the Oak street pavement or from the taxpayers of the city any portion of the expense of paving that portion of Oak street between the tracks, the rails of the track and two feet outside.

Oak street, between Main and Leroy streets, was paved with vitrified brick in 1901. The city threatened to collect all the expense of paving, except one-fifth part of paving between the rails, from abutting property-owners on said street and from the taxpayers at large. An injunction was issued by the Supreme Court restraining the council from collecting from either abutting owners or taxpayers, the cost of paving between the tracks, the rails of the tracks and two feet outside of the tracks of the Binghamton Railway Company.

Receivers for Chicago Street Railway Companies.

The Chicago Union Traction company, the North Chicago Street Railway company and the West Chicago Street Railroad company have passed into the hands of receivers on default of interest on five notes aggregating $1,154,183. Suits for the collection of the interest were filed in the United States circuit court of appeals by the Guaranty Trust company of New York and the traction companies admit the default. Judge Grosscup at once entered judgment. Demands were then made upon the treasurers of the companies and upon their being returned unsatisfied receivers were appointed as follows: In behalf of the trust company, R. R. Govin of New York; for the traction companies, James H. Eckels of Chicago; special advisor of the court, Marshall C. Sampsell, clerk of the court. The application for receivership set forth the facts that notes for $565,052 against the North Chicago company, $270,440 against the West Chicago company and $318,690 against the Union Traction company were due and with interest were unpaid. The insolvency of all the companies was alleged. The bond in each case was fixed at $75,000.

A Peculiar Civil Service Decision in New York.

A decision handed down by the court of appeals March 31 in the case of Evander M. Hamilton against the board of water commissioners of the city of Middletown, N. Y., affirms the order of Supreme Court Justice W. D. Dickey, granted several months ago, directing the commissioners to remove George R. Wengenroth from the office of clerk of the board and appoint Mr. Hamilton to the place. The decision fixes the costs against the city and in accordance with it the commissioners will have to pay Mr. Hamilton the salary of the office from the time Mr. Wengenroth began his duties as clerk on July 1, 1902.

Mr. Wengenroth was appointed clerk June 16, and on July 28 an order was obtained by Attorney Henry W. Wiggins to show cause why he should not be removed and Mr. Hamilton appointed. The order was returnable July 5, but the case was not argued until July 19, when Justice Dickey granted a peremptory writ of mandamus and an order annulling the appointment of Mr. Wengenroth and directing the commissioners to forthwith remove him and appoint Mr. Hamilton to the place. An appeal to the appellate division was taken and a stay of the proceedings granted. In October the appellate division gave a decision unanimously affirming the order of the lower court. An appeal to the court of last resort was then taken and the case again argued March 16. The proceedings were instituted under the White law passed in 1899, which gives veterans of the civil war who have passed the civil service examination preference over other candidates, without regard to their relative standing in the examination. The commissioners fought the case on the ground that they were deprived of the appointive power, and further that Mr. Hamilton was incompetent to discharge the duties of the office. The law provides, however, that the civil service commissioners are the ones to pass upon the competency and qualifications of the candidates.

Appointment of Officials by Court Unconstitutional in Delaware.

Judge Skinner has refused to appoint a member of the excise board at Orange, N. J., to succeed Wilberforce Freeman, whose term expired March 15, on the ground that the act under which that body was organized is unconstitutional. Mr. Freeman is still serving as a member of the board, however, and the disposition of the Orange authorities is to allow him to continue to do so. Judge Skinner's refusal to reappoint Mr. Freeman or to otherwise fill the vacancy in the board is in accordance with the decision of the Supreme Court several months ago which decided that the making of appointments belongs exclusively to the executive branch of the government and is a matter entirely without the province of judicial power. Orange's excise board is created under the act of 1892, which, in its provisions and the manner provided

for the naming of the commissioners, is almost identical with the Dover act which the Supreme Court declared unconstitutional because the act provided for the appointment of commissioners by the county court.

Decision on St. Paul Street Lighting Case.

Judge Lewis handed down an opinion April 10 in the case of the Western Street Lighting Company vs. the Cleveland Vapor Light Company at St. Paul, Minn. The suit was brought against the company and the city officials of St. Paul to prevent the execution of the contract between the Cleveland Vapor Light Company and the city for lighting the streets on the outskirts with gasoline. The suit first came up before Judge Bunn when the plaintiff asked for a temporary injunction forbidding the city to enter into the contract with the company. Judge Bunn declined to grant the injunction and the case came before Judge Lewis on its merits during last February. Judge Lewis decides against the Western Street Lighting Company and in favor of the city and the Cleveland Company.

The Decision in the Northern Pacific Merger Case.

The United States Circuit Court of Appeals at St. Paul, Minn., handed down a decision April 9 in the suit of United States against the Northern Securities Company enjoining the company from voting the stock of the Northern Pacific and Great Northern Railroad Companies, but allowing the return of such stock as had been delivered to that holding company. The definition of the term "Restraint of Trade" was made very broad in the decision, as follows:

The words in restraint of trade or commerce do not mean in unreasonable or partial restraint of trade or commerce, but any direct restraint thereof; that an agreement between competing railroads, which requires them to act in concert in fixing the rate for the carriage of passengers or freight over their respective lines from one state to another, and which, by that means, restricts temporarily the right of any other of such carriers to name such rates for the carriage of such freight or passengers over its road as it pleases, is a contract in direct restraint of commerce within the meaning of the act, in that it tends to prevent competition; that it matters not whether, while acting under such a contract, the rate fixed is reasonable or unreasonable, the vice of such a contract or combination being that it confers the power to establish unreasonable rates, and directly restrains commerce by placing obstacles in the way of free and unrestricted competition between carriers who are natural rivals for patronage; and, finally, that congress has the power, under the grant of authority contained in the federal constitution, to regulate commerce, to say that no contract or combination shall be legal which shall restrain interstate trade or commerce by shutting off the operation of the general law of competition.

The attorneys for the Northern Securities Company and the Northern Pacific and the Great Northern Railway Companies appeared before Judge H. Sanborn of the United States Circuit Court at St. Paul, April 20, to request that the decree be so far suspended as to permit the payment by the railroads of the regular May dividends of the Securities company. The petition was granted and the dividends will be paid until the merger case is finally disposed of by the Supreme court.

Winona, Minn., Contract for Electric Light Plant Enjoined.

A decision was rendered by Judge Snow recently against the city of Winona, Minn., granting the request of the taxpayers for the injunction restraining the city from entering into a contract with W. I. Gray & Co. of Minneapolis for an electric light plant. The injunction was granted on the ground that the contract was improperly awarded, there being no real or true competition, and it holds until the May term of court when the case will be heard on its merits. The decision did not touch upon the constitutionality of the law relating to the issue of bonds for electric light plants.

CEMENT AND CONCRETE.

Canadian Standard Tests—Government Investigation of Industry—Manure on Concrete—Specifications for Concrete—Statistics.

Canadian Standard Portland Cement Tests.

The following extracts are taken from the recommendations of a committee of the Canadian Society of Civil Engineers on cement testing:

All experiments shall be carried on, as nearly as possible, at a uniform temperature of 65 deg. Fah., except when tests are being made for the purpose of ascertaining the comparative strength of cements required for winter use.

Proportions—All proportions shall be determined by weight.

Fineness of Cement—A maximum residue of 10 per cent. shall be retained on a sieve of 10,000 meshes to the square inch, and the whole of the cement shall pass through a sieve of 2,500 meshes to the square inch. A mechanical sifter, working automatically by jig motion, and thus eliminating personal error, is recommended.

The sieve shall be periodically examined with great care, as moisture sometimes collects on the wire, so that, when a residue test is made, this moisture mixes with the cement, causing a coating of the wires, and often appreciably diminishing the area of the mesh.

Mr. Walter Buehler, in charge of cement testing for the Indianapolis City Engineer, recommends benzine as the best agent for cleaning the sieves when they are thus coated, stating that it promptly and effectually removes the residue.

The sand for standard tests shall be quartz, crushed so that the whole can pass through a sieve of 400 meshes to the square inch, but sufficiently coarse to allow of the whole being retained by a sieve of 900 meshes to the square inch.

Specific Gravity—The specific gravity is for the purpose of determining the degree of calcination of a cement with certainty, and is, therefore, of great importance. The specific gravity of a Portland cement shall be at least 3.09, and shall not exceed 3.25 for fresh cements, the term "fresh" being understood to apply to such cements as are not more than two months old. The gravimetric system is recommended for the determination of the specific gravity.

Portland cement improves with age, provided it is properly stored and kept in air-tight bags or barrels. Specifications, therefore, should not prescribe "only fresh" cement.

Tensile and Compressive Tests.—The strength of Portland cements sha l be determined by testing neat cement, and, if required, a mixture of neat cement and quartz sand. The tests shall be made in a uniform manner (both for tension and compression) with briquettes of the same form and same cross section and with the same apparatus.

Neat Cement.—Neat tests, except where fineness, specific gravity and hot bath blowing tests are also made, are misleading as to the value of a cement. Briquettes of neat cement, in which these characteristics have been determined and found to be satisfactory, shall bear a tensile stress of 250 pounds per square inch at the end of three days; 400 pounds per square inch at the end of seven days, and 500 pounds per square inch at the end of twenty-eight days. All briquettes shall be one day in air, under a damp cloth or in a damp chamber, and submerged in clean water for the remainder of the time periods. Any cement which shows a decrease in strength on or before the twenty-eighth day is to be rejected. The decisive tests shall be considered as the average of five briquettes, although for ordinary practice two or more briquettes may be sufficient and, in the latter case, only the highest test of the group is to be taken as the strength of the cement.

In determining the tensile strength of a briquette, the area of the broken surface shall be measured with great accuracy, as errors sometimes exceeding 10 per cent. are possible unless such measurements are insisted upon.

Sand and Cement.—In sand tests, the sand and cement must be thoroughly mixed together when dry. After the water has been added, either for neat or sand tests, the mortar shall be thoroughly mixed for a uniform time; suitable periods being two minutes for machine mixing and five minutes for hand mixing.

Briquettes made of one part cement and three parts standard sand, shall remain in a damp atmosphere for twenty-four hours, when they shall be immersed in water and shall then bear a tensile stress of 125 pounds per square inch after submersion for six days and 200 pounds per square inch after submersion for twenty-seven days.

At the end of the same period the minimum compressive strength of a mixture of one part cement to three parts sand shall be 200 pounds per square inch.

(Note—Quick setting cements generally show a lower strength than that specified above.)

The tensile strength of briquettes, mixed in the proportion of three to one, or of other sand briquettes, shall not show a decrease either on the twenty-eighth day or subsequently.

In every case the quantity of water used in mixing shall be stated in the report.

Adulterations, Etc.—Any cement containing ad lteration shall not be accepted as a Portland cement. There are also certain ingredients which should be strictly limited in their amount. If there is found to be more than 2 per cent. of sul-

phuric acid, or 3 per cent. of magnesia, the cement should be rejected. It is understood that Portland cements only are being specified for. The Silica, or sand cements, are in a class by themselves, need special specifications and are not intended to be included in the present one.

Packing—Cement shall either be packed in paper-lined air-tight barrels, well constructed and hooped so that, under ordinary conditions of handling, no cement shall sift out, or if in sacks, the texture of the sacks shall be so strong and fine as not to permit of any sifting out or wasting of cement under ordinary conditions of handling. The net amount of cement, deducting the weight of the package, shall be 350 pounds per barrel.

Certificate—The manufacturer shall give a written certificate with each shipment of cement, stating (1) the date of manufacture; (2) the tests and analyses which have been obtained at the manufacturer's laboratory for cement taken from the day's grinding, of which the shipment forms a part; (3) that the cement does not contain any adulteration.

Frost Test—In case of experimental tests, made for the purpose of determining the action of cements when exposed to severe frost, it is recommended that the cements be mixed at an atmospheric temperature below freezing, with cold water and cold sand, and kept exposed to ordinary winter weather, just as they would be exposed in actual construction of masonry. A description of what is done in this connection should be kept for comparison with other results, and the records of such experiments filed with the secretary of the Canadian Society of Civil Engineers.

Government Investigation of Cement Industry.

In view of the great and steadily increasing importance of the cement industry in the United States, and in response to numerous inquiries relative to possible sources of cement materials, a detailed investigation of the subject will be undertaken this year by the United States Geological survey. During the coming field season all the areas in which Portland or natural cements can now be produced, together with other districts which seem promising, will be visited by Mr. Edwin C. Eckel with a view of preparing a survey bulletin on the "Portland and Natural Cement Industries in the United States."

Manure on Concrete.

A contribution to the literature on the subject of the effect of various materials used to protect concrete from frost is made by Mr. Walter Buehler, an assistant city engineer in Indianapolis.

A portion of the concrete section of the Northwestern avenue sewer was not completed before cold weather last fall and some of the concrete last laid was protected by covering. Some of the concrete which had set for about one week was covered with straw containing manure, some was covered with straw only and some was left uncovered. During the week the concrete had become hard but had probably not completed its final set. The portion covered with manure was found this spring to be quite soft and easily disintegrated on the surface; that covered with straw was harder, but the surface could be picked off readily, while the portion which had not been covered was hard and its surface was in perfect condition

Specifications for Portland Cement Concrete.

The following are the specifications for concrete masonry presented by a committee of the American Railway Engineering and Maintenance of Way Association at its meeting March 17:

Cement shall be Portland, either American or foreign, which will meet the requirements of the standard specifications.

Sand shall be clean and coarse, but preferably of grains varying in size. It shall be free from clay, loam, sticks and other impurities.

Stone shall be sound, hard and durable, crushed to sizes not exceeding 2 ins. in any direction and free from dust by screening.

Gravel shall be composed of clean pebbles and hard and durable stone of sizes not exceeding 2 ins diameter, free from clay and other impurities except sand. When containing sand in any considerable quantity the amount per unit of volume of gravel shall be determined accurately to admit of the proper proportion of sand being maintained in the concrete mixture

Water shall be clean and reasonably clear, free from sulphuric acid or strong alkalies.

Mixing by Hand.—1. Tight platforms shall be provided of sufficient size to accommodate men and materials for the progressive and rapid mixing of at least two batches of concrete at the same time. Batches shall not exceed 1 cu. yd. each and smaller batches are preferable, based upon a multiple of the number of sacks to the barrel

2. Spread the sand evenly upon the platform, then the cement upon the sand and mix thoroughly until of an even color. Add all the water necessary to make a thin mortar and spread again; add the gravel if used, and finally the broken stone, both of which if dry should first be thoroughly wet down. Turn down the mass with shovels or hoes until thoroughly incorporated, and all the gravel and stone is covered with mortar; this will probably require the mass to be turned four times.

3. Another approved method which may be permitted at the option of the engineer in charge is to spread the sand, then the cement, then the gravel or broken

stone; add water and mix thoroughly as above.

Mixing by Machine.—A machine mixer shall be used wherever the volume of work will justify the expense of installing the plant. The necessary requirements for the machine will be that a precise and regular proportioning of materials can be controlled and the product delivered be of the required consistency and thoroughly mixed.

Consistency.—The concrete shall be of such consistency that when dumped in place it will not require tamping; it shall be spaded down and tamped sufficiently to level off and will then quake freely like jelly, and be wet enough on top to require the use of rubber boots by the workmen.

Course.—1. Each course should be left somewhat rough to insure bonding with the next course above; and if it be already set, shall be thoroughly cleaned and dampened before the next course is placed upon it. The plane of courses shall be as nearly as possible at right angles to the line of pressure.

2. An uncompleted course shall be left with a vertical joint where the work is stopped.

3. The work should be carried up in sections of convenient length and completed without intermission.

Expansion Joints.—1. In exposed work expansion joints shall be provided at intervals of thirty to fifty feet. A temporary vertical form or partition of plank shall be set up and the section completed as though it were the end of the structure. The partition will be removed when the next section is begun and the new concrete placed against the old without mortar flushing. Locks shall be provided if directed or called for by the plans.

2. In reinforced or steel concrete the length of these sections may be materially increased at the option of the engineer.

Time.—Concrete shall be placed immediately after mixing, and any having an initial set shall be rejected.

Facing.—About one inch of mortar of the same proportions as used in the concrete may be placed next to the forms, immediately in advance of the concrete, or a shovel facing made, at the option of the engineer in charge.

Forms.—1. Shall be substantial and unyielding, properly braced or tied together by means of wire or rods.

2. The material used shall be of dressed lumber, secured to the studding or uprights in horizontal lines.

3. Planking once used in forms shall be cleaned before being used again.

4. The forms must not be removed within forty-eight hours after all the concrete in that section has been placed. In freezing weather they must remain until the concrete has had a sufficient time to become thoroughly set.

5. In dry but not freezing weather the forms shall be drenched with water before the concrete is placed against them.

6. For backings, undressed lumber may be used for forms.

Finishing.—1. After the forms are removed, any small cavities or openings in the concrete shall be neatly filled with mortar if necessary. Any ridges due to cracks or joints in the lumber shall be rubbed down; the entire face shall then be washed with a thin grout of the consistency of whitewash, mixed in the proportion of one part of cement to two parts of sand. The wash should be applied with a brush

2. The tops of bridge seats, pedestals, copings, wing walls, etc., when not finished with natural stone coping, shall be finished with a smooth surface composed of one part cement to two parts of granite, or other suitable screenings, or sand applied in a layer one to one and one-half inches thick. This must be put in place with the last course of concrete.

3. In arch tops a thin coat of mortar or grout shall be applied over the top to thoroughly seal the pores.

Proportioning.—The proportion of the materials in the concrete shall be as if specifically called for by the contract, or as set forth herein, upon the lines left for that purpose; the volume of cement to be based upon the actual cubic contents of one barrel of specified weight.

Cement Statistics.

During February, 1903, 137,707 barrels of cement and other hydraulic materials, assuming 380 pounds per barrel, were imported, as compared with 102,254 barrels imported in February, 1902. There was a large increase in the importations from England, over eight times as much as last year, and from Belgium over three times as much, and a material decrease in those from Germany, about 40 per cent. In the eight months ending February, which about covers the period since the increase in importations began, there were 2,041,172 barrels imported this year, as compared with 805,732 last year. There was an increase in the importations, except from Canada and "other countries."

Exports of cement for February have fallen from 16,158 barrels in 1902 to 7,888 barrels in 1903. Re-exportation of foreign cement fell from 3,016 barrels in February, 1902, to 2,290 barrels in 1903. The amount remaining in warehouse at end of month also was reduced from 61,462 barrels in February, 1903, to 16,266 barrels in February, 1902. Even the exports to Porto Rico were reduced from 1,582 barrels to 300 barrels, all showing that the domestic demand for cement is less than the domestic supply by an increasing amount. It is possible that the increases in importations from England, and especially from Belgium, are of cheaper grades than those from Germany, in which a decrease is noted, showing that the competition is in price rather than in quality, and that the improvement in the German cement market prevents the export of Ger-

man cement, except with reasonable profit.

The Canadian production of Portland cement in 1902 is reported to have been 594,594 barrels, and of natural hydraulic cement 124,400 barrels.

WATER AND SEWERS.

Meters at Red Wing and Columbus—Legislation to Protect Water Supplies—Private Fire Protection Systems—Organisms in Potable Waters—Sewers in Country Districts—Sewer Cleaning Machine—Sewer Tunnel—Sewage Sludge as Fertilizer.

Effect of Meters at Red Wing, Minn.

The report of the water board at Red Wing, Minn., states that the experiment of compelling water consumers to use meters during the last year caused the consumption of water to fall off one-third. Collections for water rents were $5,618.97 and by meter rates $1,162.

Method of Accounting for Meter Deposits in Columbus, O.

A verbal opinion has been rendered to Dudley Filler, secretary-treasurer of the water works department and deputy director of Public Improvements at Columbus, O., by First Assistant Addison of the Law Department regarding meter deposits. The opinion was called out by A. C. Ady, who desired to know what disposition had been made of money which he had deposited for water meters, and which had been assigned by him to the Hanover Pressed Brick Company. In settlement of claims against him when he made his assignment in 1895 Mr. Ady had deposited $55 for meters, and this sum was turned over to the Hanover Company, which made application last fall at the water works department for the money, but it seems the claims were not allowed at the time. Mr. Ady is not certain that he did not assign the meters to the later tenants of the house. There is no way by which the water works department can be apprised of the transfers of meters from the original owners. Assistant Addison advised Mr. Filler to pay out no deposits unless the assignment of the deposit had been made, and receipt presented showing that an equivalent of the deposit for the meter had been made by the latest holder, together with his assignment. The accounts can in this way be kept straight and the department would never pay out any money through the withdrawal of deposits without an equal sum being left with the department.

Value of Legislation for Protecting Purity of Water Supplies.

In his annual report to the legislature Dr. Daniel Lewis, State Commissioner of Health, said:

The protection of the sources of the water supplies of the various municipalities of the state is one of the most important functions delegated to the department under the public health law. Such protection against pollution of the water supplies, bears directly and emphatically upon the general and sanitary condition of the state. It is well recognized that many diseases may be communicated through drinking water, the most notable example of which is typhoid fever. Reference has just been made to the fact that 1,318 deaths from typhoid fever occurred in the state during the past year. It is fair to state that each one of these deaths was the result of neglect to supply pure water and that nearly, if not all, of them could have been prevented if the recognized requirements had been in operation in every instance.

Under the law now in force, rules for the protection of water supplies may be formulated by the state department of health upon application by the municipality using the water, by the company supplying it or by an individual. It is the custom of the department to make such rules sufficiently comprehensive to prevent all contamination of a dangerous or doubtful character. When such rules are approved by the state commissioner of health, and published for six weeks in a newspaper in the county or counties in which the watershed is located, they have all the force of law and prosecutions may be made against offenders, and penalties imposed. In other words those rules are capable of thorough enforcement.

It is a source of surprise and regret to your commissioner of health that every municipality with a general water supply has not availed itself of this simple and effective way of securing pure water. It is a notorious fact that epidemics have occurred in the state attended by numerous fatalities which never could have occurred had this protection been secured which the state has now provided for many years.

As a very general pollution of the water courses and bodies of water throughout the state was believed to exist, the department undertook an inspection of a large number at widely separated points in the state during the past year and secured evidence of the very general neglect to protect the purity of those various water supplies. The necessity for immediate and general legislation which shall at least prevent an increase of these contaminations seems to be a public necessity. To meet this necessity a bill for the prevention of the pollution of fresh waters of the state by limiting or absolutely preventing the discharge of untreated sewage and other refuse or waste matters, has been prepared and introduced in the legislature. The passage of this act with such modifications as the experience of the members of the legislature may suggest, would be one of the most far-reaching advances in public sanitation in this state which has been passed for many years and would result in the prevention of future epidemics and the saving of the lives of many citizens.

Committee on Methods of Control of Private Fire Protection Systems.

At the last annual convention of the New England Water Works Association, the following motion, made by Mr. Frank C. Kimball, superintendent of water works at Knoxville, Tenn., was unanimously passed:

"That a committee of three be appointed by the president, whose duty it shall be to ask for the appointment of and to confer with similar committees from the American Water Works and other kindred associations and also with the various underwriters' associations, to agree, if possible, upon some adequate means of controlling private fire supplies acceptable to all parties concerned, including therein all questions relating to charges therefor and similar matters."

Messrs. F. H. Crandall of Burlington, Vt., R. J. Thomas of Lowell, Mass., and Elbert Wheeler of Boston, Mass., the committee appointed in compliance with the instruction contained in the above motion, invite correspondence and suggestions from all interested in a fair and equitable assessment of the benefit conferred in supplying fire protection by means of private fire protective systems.

The committee, so far as their investigation has progressed, find that nearly everywhere, both in case of public and private ownership, it is customary to recognize the service of the water works to the public, in the line of fire protection. A frontage tax, hydrant rental, general appropriation, or an overdraft, serving as means to secure the assessment upon the property benefited of the cost of fire protection.

The capacity of works necessary to supply the volume of water required to make private fire services of value, the leaks habitually permitted on unmetered services, to which fire services are no exception and the stealing which not infrequently takes place from such services, all entail expense, to cover which an assessment should be made upon the parties directly benefited.

As in the case of schedule rate assessment, the convenience or advantage accruing from additional fixtures, together with the additional cost of the service, constitutes a basis for increased assessment, so in the case of fire protection, increased benefit and increased cost of service constitute a basis for increased assessment.

The individual benefit enjoyed by the possessors of private fire protective systems is far in excess of that enjoyed by the general public, to which latter benefit, by reason of payment of taxes, all are to a reasonable extent entitled.

As the Hon. J. O. Hall of Quincy said at the 1902 convention of the New England Water Works Association, "The individual taxpayer should not be compelled to bear any burden which by any interpretation can pass into an individual benefit to somebody else."

That private fire protection should yield the company or department furnishing it a fair return, that a request for a service for fire or any other purpose unaccompanied by willingness to furnish correct and trustworthy information as to the amount of water used or wasted through it is unreasonable, and that the size of services, for whatever purpose used, should be kept well within the capacity of the system of supply, without excessive loss of pressure, are conclusions easily and speedily reached. How to determine an amount constituting a fair return, is a question upon which the committee find room for a greater difference of opinion.

The committee promise to all communications and suggestions their thoughtful consideration.

Organisms in Potable Waters.

From a paper before the Iowa Engineering Society by Dr. L. H. Pammel of Iowa State College, the following extracts are taken, mainly to show the prevalence of organisms in drinking water from various sources and the office of many of them:

A complete sanitary examination of the water in a laboratory consists of a biological, physical and chemical examination. In the biological examination we determine under the head of microscopical, the number of organisms per cc. and

also the amount of inorganic amorphous matter; under the head of bacteria the number of germs per cc., noting especially the presence of intestinal or pathogenic bacteria. In a microscopic study of water we are dealing with both plants and animals, but I am not concerned in this paper with the subject of animals. The different plants found may be grouped as follows: Diatom, green algae, blue green algae and fungi. In regard to the plants it may be of interest here to state that there is a seasonable distribution. Mr. Whipple ("Microscopy of Drinking Water"), who has given the subject a great deal of attention, states in reference to the seasonal variation in the species of these organisms in lakes:

"If the lake is a typical one the water during the winter will contain comparatively few organisms; in the spring various diatoms will appear; these will disappear in a few weeks and in their place will come the green algae. At the same time the blue green algae may be found. In the fall both of these will vanish and the diatoms will develop again. As the lake freezes these will in turn disappear." Those who are interested in the subject will find the facts brought together in excellent shape by this author.

The subject of bacteriological analysis of water has been investigated by a large number of different persons. It is worthy, however, of all the consideration that has been given to it. The subject is discussed fully in an admirable work by the Franklands, "Micro-Organisms in Water," and a large number of the textbooks dealing with the subject of bacteriology give more or less prominence to this question. A knowledge of the bacteria present in water is, therefore, of prime importance. While it is true that the common putrefactive species may not in themselves be dangerous only as they give off the products of decomposition, yet there are certain species which, while commonly not disease producers in man like typhoid or Asiatic cholera, are nevertheless pathogenic under some conditions. Moreover, they are found in human and lower animal dejecta. The presence of such species is a sign of sewage contamination. It is a well-known fact that there are several common species in the soil that are closely allied to the bacteria coli-communis, the bacillus common in the intestinal tract of man, so that the subject of bacteriological analysis of water is confronted with great difficulties. And right here, before I take up the question of organisms in the water, it is proper to refer to those that are common in the soil. Miquel, the celebrated French investigator, states that there exist in a gram of ordinary soil at Montsouris 750,000 bacteria, in the Rue de Rennes 1,300,000 and in the Rue de Monge 2,100,000. These soil bacteria are of the greatest importance in the economy of nature. It has been well said that while bacteria cause much misery in the world they are our great benefactors. Without them there would hardly be any rot or decay. Our beautiful landscapes could not exist. The earth garnished with the bloom of flowers, the green herbs, its magnificent forests, our cereals and food plants would not have the material from which to build up their fabric, except for these tiny plants. The nitrogen so essential for all living plants is only made ready for the use of plants by these wonderful micro-organisms.

In the disposition of sewage the question of nitrification is a most important one. Suffice it to say in this connection that there are two distinct processes concerned in nitrification. On the one hand the complex nitrogenous substances are converted into ammonia, and on the other the ammonia is converted into nitric acid. Each of these processes is brought about by the action of specific micro-organisms. In addition to the process of nitrification, we know from experimental research that de-nitrification may occur. That is, the nitrates may be reduced to nitrites. We have found in our laboratory that a half dozen common putrefactive species are capable of reducing nitric acid. The whole subject is so important that it can only be discussed by going into the subject exhaustively. We must, therefore, be content with the skeleton outline of the subject given here. For a more extended account we must refer you to the copious literature on the subject that has been issued during the last few years in books and bacteriological journals. To return again to the subject of water, a few facts may be given, more especially such facts as pertain to our own water.

We would have you observe at the outset that there is a wide difference in the bacterial contents of water. Dr. Gruber sets the maximum number of bateria to be found in spring water from 40 to 50, in well water from 300 to 500 per cc. Fraenkel states that good drinking water should not have more than 50 germs per cc. Many bacteriologists place the limit at 1,000 germs per cc. It is stated that the water taken from the Croton reservoir, New York, contained from 5,000 to 15,000 germs per cc. Water taken from the Munich supply contained from 305 to 12,606 germs per cc. Fraenkel estimated the number of germs in the water supply at Berlin at 6,140, while below the city there was a great increase, the number being 243,000 per cc. The Kiel water supply, according to Breuning, has from 62 to 1,712 germs per .5 cc, the number of liquefying species varying from 4 to 188. Wells in the same city had more than 26,000. Many other examples were given in the paper.

There is a very wide difference in the number of bacteria in different well waters. Pure spring water should contain relatively few bacteria, since the chances for contamination are so small. Libbertz found no germs in the water from springs of Frankfort-on-Main, while in other cases from the same springs he obtained from 50-60 bacteria per cc. Furbringer found from 32 to 156 in a cc. from Jena, and in Zurich Cramer found from 9 to 3,425. In the Uintah mountains of Utah a number of springs were tested by a member of our botanical party. In one case there were no bacteria present, in the other only 50 per cc. Our own col-

lege spring water supply has been investigated at different times. In 1892 Messrs. McCall and Patton found from 56 to 320 germs per cc. Tests in 1891 showed from 50 to 300. Dr. W. T. Sedgwick investigated the bacterial contents of a number of springs in New Hampshire. The results were very constant, running from 72 to 218.

Naturally we find great variation in the bacterial content of wells. It will not be necessary in this connection to refer to studies of European wells, but it may be of interest to quote a few figures from the data furnished by Dr. Sedgwick and Mr. Prescott. Different wells yielded results varying from 140 to 602. They also record results from a number of deep tubular wells. The number was very small, varying from 50 in one case up to about 300, average number about 250. The water from the deep well here at the college has a bacterial content that varies from about 50 to 250, though a few times running higher. The average of six samples is about 276.

A number of analyses of the bacterial contents of the various wells near the college have been made. Some of the results are as follows. They were made in 1901. Averages are given of several tests: Pritchard well, 35; Illsley well, 1,642; Munn well (tile), 300; Pammel (brick), 500; Budd (deep), 40.

Owing to the large amount of surface water present in the wells this last season many of these wells were again investigated, and almost invariably the number of bacteria was very much larger: Following are the results: Paxton well, 12,000; James Robb well, 2,400; Pammel well, 9,200.

One of the most important of pending questions in the state today is the supply of good water and the proper disposal of sewage for the farmer and for small villages. For the small towns some such disposal system as is in operation here at the college, or the one planned by Prof. Marston for Grinnell. We urge upon every community the necessity of taking steps to inaugurate a sewage disposal and a common deep well supply of water.

New York Law Regulating Construction of Sewers in Country Districts.

The state of New York has a law under which sewer systems can be constructed in districts not included in any incorporated village or city. The principal provisions of the law are as follows:

Section 1. The town board of any town on the petition of a majority of the owners of real property in a proposed district, representing a majority of the taxable property therein, as appears by the last preceding completed assessment roll, may establish a sewer system outside a village or city. The petition must describe the proposed district, and state the maximum amount proposed to be expended in the construction of such sewer system. Each petitioner shall state opposite his name the assessed valuation of the real property owned by him in such district according to the last preceding completed assessment roll. The petition must be signed by the petitioners and acknowledged in the same manner as a deed to be recorded. There shall be annexed to and presented with such petition a map and plan of the proposed sewer system with specifications of dimensions and connections, and outlet or sewage disposal works prepared by a competent engineer at the expense of the petitioners.

Sec. 2. If the town board is satisfied that the petitioners are a majority of the owners of real property in the proposed district, and own a majority in value of the taxable property therein, they shall make an order establishing such district and appointing three taxpayers therein as sewer commissioners, who shall hold their office at the pleasure of the town board.

Sec. 3. Provides that commissioners shall take oath of office and file official undertaking.

The sewer commissioners shall cause a copy of the map and plan of the proposed sewer system to be submitted to the state department of health, and if approved it shall be filed in its office. Such map and plan may be amended with the approval of the state board of health, and if amended, it shall be filed in the office of the state board of health and of the town clerk.

Sec. 5. The sewer commissioners of such district shall advertise for proposals for the construction of a sewer system according to such map and plan, either under an entire contract or in parts or sections as the board may determine. No contract shall be made by which a greater amount shall be agreed to be paid than the maximum amount stated in the petition for the construction of such sewer, including the expense of superintendence and inspection as provided in section six hereof. Each contract shall be executed in duplicate one of which shall be given to the contractor and the other shall be filed in the office of the town clerk.

Secs. 6 and 7. Empower the commissioners to employ a superintendent of construction and inspectors and to acquire necessary real property by condemnation.

Sec. 8. The sewer commissioners shall prepare and file in the office of the town clerk a map and plan of such district which shall show the highways and the several parcels of land therein. The expense of the construction of such sewer shall be apportioned by such commission-

ers on the lands within such district in proportion as nearly as may be to the benefit which each lot or parcel will derive therefrom. After making such apportionment the board shall serve on each land-owner a notice of the completion thereof and of the filing of such map and plan, and that at a specified time and place a hearing will be had to consider and review the same. Such notice must be served at least six days before the hearing, personally, if such land-owner can with reasonable diligence be found within the state, otherwise by mail addressed to the land-owners' last known postoffice address. The commissioners shall meet at the time and place specified to hear objections to such apportionment and may modify and correct the same. The sewer commissioners upon the completion of such apportionment shall file the same in the office of the town clerk. The apportionment shall be deemed final and conclusive unless an appeal is taken therefrom within fifteen days after the filing thereof

Secs. 9 to 13. Provide for appeal from an apportionment to the county court and for reapportionment if reversed, and by commissioners appointed by the court if found erroneous or inequitable, the costs to be borne by the sewer district.

Secs. 14 to 16. Directs the sewer commissioners to assess the expense of construction on the property benefited in accordance with the apportionment established, and for all unpaid after 30 days the town board shall issue bonds, to be paid by the lots in default. The cost of maintenance shall be a charge upon the sewer district.

A New Sewer Cleaning Machine.

A shovel mounted on the front end of a three-wheel platform is the prominent feature of the Healey sewer cleaning machine. It has attachments for ropes to keep it in proper position and to raise the shovel, which are essential to its successful working. To operate it a rope must be passed through from one manhole to the next by means of a jointed rod or otherwise. The machine is then inserted in the sewer at the lower one of the two manholes and drawn into the sewer by the rope from the other manhole. When the shovel is thought to be full the machine is drawn back and the shovel emptied and pulled in for another load. If a sewer is badly filled with silt a smaller machine can be worked through first and one of the size for the sewer later. By hauling on a third rope the front edge of the shovel can be raised to pass over any such obstructions as a brick projecting from the invert, the edge of a pipe somewhat out of place, etc.

The New St. Louis Sewer Tunnel.

The sewer tunnel being built under Arsenal-st. in South St. Louis will be 6,000 feet long, and when completed it will afford an outlet for all the small sewers in that part of the city and will relieve Mill creek sewer along Chotoau river. It is being built through solid rock and, aside from sanitary features, it is said to be remarkably interesting from an engineering standpoint. The Buehler-Cooney Construction Company is building the tunnel. The work was commenced about six months ago and will be completed in about six months more. The tunnel is 8 feet 8 inches in diameter and 24 feet in circumference and is the largest tunnel of its kind west of the Mississippi river. It will be constructed of brick, which will be laid in three courses, with a thickness of thirteen inches. About 2,000,000 brick, twenty carloads of cement and 100 carloads of sand will be used in its construction. It will cost $120,000.

Experiment with Sewage Sludge as Fertilizer at Providence, R. I.

The city of Providence, R. I., is making experiments with sludge as a fertilizer on the city's property at Field's Point. The solid stuff obtained from the sewage taken from the precipitation works was spread around the lands and the filter beds recently, and it is believed that the action of the sludge has been beneficial to the grass, although it is too early to determine the actual value of sludge when used for enriching the soil. Full information will be available, it is believed, at the end of the year.

Syracuse Water Works Report.

The annual report of the bureau of water, Syracuse, N. Y., shows that the distributing system consists of 170.46 miles of mains ranging in size from 36 inches to 4 inches. Besides there is a pipe line from Skaneateles Lake with a length of 19.29 miles of 30 inch pipe. The hydrants in use number 2,693. The average daily consumption of water during the last year was larger than during any previous year. Thos. F. Delaney, supt., says that the limit of 14,000,000 gallons is rapidly being reached and he renews his suggestion of the question of the city laying another 30-inch conduit from Skaneateles Lake or of metering the services for the purpose of preventing waste and prolonging usefulness of the present conduit. The consumption of water per day during the last year was 11,927,000; in 1901, 11,604,000 gals.; in 1900, 10,995,000 gals; in 1899, 10,030,000 gals.; and in 1898, 8,553,000 fallons.

STREETS AND STREET CLEANING

A Street Cleaning Machine—Chicago People Responsible for Dirty Streets—Curb and Gutter Assessments—Street Repair Enforcement—Harrisburg Paving—Nashville Bitulithic—Convict Labor on Roads—Asphalt Trust Sale—Competition in Patented Material—Repair Clause.

A German Street Cleaning Machine.

A recent German street sweeping machine is comprehensive enough to contain everything from a sprinkling tank to a cart to carry the sweepings. The machine is mounted on two large wheels, with a small-wheeled truck in front over which is placed the sprinkling tank, on top of which is the driver's seat. Two revolving brooms having a slight angle to drive the sweepings toward the center of the wagon are set just behind the large wheels. They are connected by a flexible piece with a slight curve. The sweepings collect on a platform at the center of the wagon, which is automatically scraped at intervals, the dirt being raked toward a bucket elevator which lifts it and dumps it into a cart which is towed behind and can be replaced by an empty cart when full. Eight feet width is sprinkled and swept and the machine runs easily at the rate of three miles an hour. Two machines working together, each requiring one driver, are said to do the work of twenty men. The weight is somewhat excessive.

The Indiana Method of Assessing for Curb and Gutter Improvements.

Protests against the new improvement law, which does not allow Indiana municipalities to pay any fixed proportion of the cost of curbing and gutters, is being made by the property-owners of Richmond, Ind. The custom of that city for many years has been to pay a portion of the cost of such improvements, the basis being fixed by the scale of contractors for this work, which averages 80 cents a foot. Several thousand dollars have been paid out of the city treasury each year for improvements of this character.

The city commissioners must, under the new law, assess the benefits against each property-owner, and if the total amount assessed does not reach the full cost of improvement, then the residue only may be paid by the city. Property-owners feel that the law is wrong and allege that a curb and gutter are in the nature of permanent public improvements and that the city should bear a fixed proportion of the cost.

Property-Owners Held Responsible for Chicago's Dirty Streets.

In commenting on the annual complaint against dirty streets, Mayor Harrison of Chicago recently said:

Let the property-owners pave their streets and then give the administration enough money to keep them clean. Unless we had a surface we could not keep the streets clean if we had $10,000,000 a year.

There will be less money than ever this year at the disposal of the street cleaning fund in that city as the cost of teams and labor is increased.

The Chicago News puts the case as follows:

"Oh, take your shovel and your spade,
your pickax and your mop.
Go forth to clean the dirty streets as
city dads advise.
And if you have a dredging plant somewhere about the shop.
You'll find 'twill be a handy thing; take it along likewise."

Method of Enforcing Street Repairs in New York.

The commissioner of public works of New York City issued formal notice April 20 that until the asphalt companies put the streets they are responsible for in proper condition they can do no work on new contracts with the city. The appropriation of $2,300,000 for paving purposes, to be spent before next winter, will not, therefore, be used until the repairs of the streets for which the asphalt companies are liable are complete.

Report on Harrisburg Street Paving.

The Municipal League of Harrisburg, Pa., recently obtained a report from Mr. N. P. Lewis, the Chief Engineer of the Board of Estimate and Apportionment of New York, upon the best materials to use in paving streets in that city which contains a valuable discussion of the qualities of the materials deemed by him most suitable for the local conditions.

Fifty-eight streets are named in the improvement ordinance, which limits the cost of the paving to $2 a square yard and of curbing to $1.25 a linear foot. The

traffic on the streets is classed as light and the grades, except on a few streets, are easy. Smooth and quiet pavements are therefore possible. This rules out granite block, and the expense of repair and macadam rules that pavement out. Wooden block laid in manner to insure a good pavement is ruled out as being above the ordinance limit of cost. This leaves for consideration sheet and block asphalt and vitrified brick of long use and Warren's bitulithic pavement, which Mr. Lewis believes will be a successful pavement.

After a consideration of these materials much after the manner of an article in Municipal Engineering for April, page 290, entitled "The Principles Upon Which the Choice of a Street Pavement Depends," Mr. Lewis recommends that about one-third of the area to be improved be laid with Warren's bitulithic pavement, most of these streets having grades of over 4 per cent. The total area for this pavement finally decided upon is 23,405 square yards on eight streets. Vitrified brick is recommended for 7,610 square yards on three streets, which have already been partly paved with brick, one of these having a 5 per cent. grade. Fifty-one streets, all but two or three being short, are recommended for asphalt, with a total area of 194,470 square yards. These are all on light grades. A bitulithic or brick pavement parallel to the principal business street is recommended for use when the asphalt is in slippery condition.

Mr. Lewis would not permit other persons than the inventor and promoters of Warren's bitulithic pavement to lay bituminous macadam, believing that "failure would be invited if it were laid by those whose interests are inimical to its success." He calls attention to the variety of asphalts now on the market and to the necessity of care in letting contracts for that material, and recommends that no bid be accepted from a contractor who has no successful pavements more than one year old.

The narrowing of roadways, except on streets with railway tracks, is strongly recommended; also the thorough cleaning of streets, so that sprinkling will not be necessary, especially on asphalt streets. The necessity for inspection of construction which inspects is strongly emphasized.

Nashville Bitulithic Paving Was Put Down to Stay.

The Nashville, Tenn., News gives an entertaining account of the efforts of a street railway gang to move one of its rails a few inches in widening the gauge of the tracks for sixty or seventy feet in the pavement laid last year by the Warren Bros. Company on the public square. It seems that two days' work of twenty or more men were necessary to get out the strip of about seventy square feet area. This is evidence of the solidity of the pavement and the tenacity of the materials composing it.

This experience gives additional strength to the recommendation made in an article on page 172 of the March number of Muncipal Engineering. In that article, which was entitled "How to Lay Interurban Track in Cities," it was suggested that bituminous macadam, made after the Warren methods, suggested its adaptability for use as the foundation for street railway tracks, and while it would hardly be possible to do away with ties altogether as one of the street railway men suggested in the report referred to, the bituminous macadam would make an impervious foundation which would keep the water out of the soil below and thus keep it solid. The Nashville case shows that the paving material has a strong hold on the rail and tie, which adds greatly to the solidity gained by keeping the water out of the soil beneath.

Convict Labor on Roads in Illinois.

The Illinois legislature has adopted a resolution recommending that prisoners and convicts be employed in working on public highways and in the making of road materials and crushing stone for use on the public highways and in the care and construction of buildings and grounds where they are permanently confined, all of such labor to be performed in the communities which are taxed for their conviction and support.

The Asphalt Trust Sale Ordered.

An order has been issued to sell the assets and properties of the asphalt trust at the Jersey City court house on May 15. When the order was entered John M. Mack resigned his receivership and probably one will be appointed in his place at least until after the sale.

The report of the receivers for 1902 was filed on the same day showing that the National Asphalt company had conducted a business of $13,388,000 during the year with a profit of $775,408, less $222,653 losses incurred prior to the receivership by two of the subsidiary companies.

The total amount realized by the sale of the asphalt securities must not be less than $6,000,000 according to the instructions of the court. They will be offered in four classes and also as a whole, and the highest bid or combination of bids will be accepted provided it is more than the minimum price set. Cash, certified check

or bonds of the Asphalt Company of America amounting to $1,500,000 face value must accompany each bid for the total property.

It is openly claimed in the daily newspapers of Philadelphia that the reorganization of the trust upon the plans of the promoters depends upon the securing of $2,000,000 in contracts for asphalt paving from the city of Philadelphia.

Competition Possible Under Specification of a Patented Paving Material.

At the request of several readers some statement is made of the grounds upon which the specification of Warren's Puritan brands of bituminous cements and Warren's patent bitulithic pavement is defended by municipal authorities and approved by the courts.

As reported in Municipal Engineering for April, page 284, the circuit court in St. Louis approved of the specification of Warren's cements in a suit for injunction brought against the St. Louis board of public improvements by W. H. Swift, who is the president of the Fruin-Bambrick Company, one of the subsidiary organizations of the asphalt trust. Aside from minor technicalities the suit was based on the claim that the property-owner was deprived of the benefit of competition. The law in Missouri requires full plans and specifications before work can be ordered. Two of the technical points made in the suit were that choice was permitted in one clause between granite and porphyry, and in another between stone chips and cement, while the main point contended for was that no choice was permitted in the matter of the bituminous cement. The first two points were dismissed with the statement that "it has been repeatedly held by the courts of this state that matters of detail need not be stated in an ordinance, but may be left to the discretion of the proper officers to be exercised in the light of business principles." With reference to the main point the court said that "it is conceded in this case that the board of public improvements in the exercise of their legislative discretion to select the kind of material which shall be used in the construction of a street, may arbitrarily select the material thus to be used, and having so selected such material, its discretion cannot be reviewed by the court. The board in this case having selected the kind of material to be used in the construction of W. Pine-st. the question to be determined is whether in such selection it has excluded other available coal tar cements suitable for the purpose and thus prevented competition."

He then proceeds, as reported in the article in the April number above referred to, and decides that according to the evidence there are no bituminous cements equal in quality to Warren's Puritan brand upon the market. He cites decisions of former years in favor of the adoption of the Nicholson patent pavement and of Trinidad Pitch Lake asphalt, controlled by single companies, as pertinent in the present case, since those decisions were based upon the fact that at the time those materials were chosen for pavements there were no methods or materials of the same kind in the market which were of equal quality.

A similar suit for injunction against the letting of paving contracts with Warren Brothers Company's materials was brought by the Barber Asphalt Paving Company before Justice Blanchard in New York City under the provision of the city charter which states that "except for repairs, no patented pavement shall be laid and no patented article shall be advertised for, contracted for or purchased except under such circumstances that there can be a fair and reasonable opportunity for competition, the conditions to secure which shall be prescribed by the Board of Estimate and Apportionment."

The decision in this suit has not yet been reported. It is defended upon the ground that the Board of Estimate and Apportionment has the right to determine the conditions under which competition can be secured, and that in this case they are secured by the agreement of the Warren Brothers Company to furnish the special materials for the pavement and an expert to supervise its construction to any responsible contractor desiring to bid upon the work at a fixed price per square yard. This claim is believed to be on as good a basis as a specification calling for the use of a particular material, obtainable from a single company, under which most of the asphalt pavements in the city of New York have been laid. It is also reported that a claim is made that this provision of the charter is unconstitutional.

The New York Tribune in an article upon the subject states that the asphalt paving company offered to "do the job without cost, going so far as offering to stand the expense of litigation. Permitting a competing concern to lay the pavement was so evident a desire to control the situation that it was decided, in all fairness, that the primary laying of the bitulithic pavement in New York should be done only under direct supervision of the inventor and owners of the patent rights. It would, therefore, be

laid according to methods that have proved its merit elsewhere."

The difficulties which would arise under such competition are foreshadowed in the reports from Cleveland, O., where the same asphalt paving company has taken contracts for brick paving and is already the subject of complaint for the quality of the brick offered.

The St. Louis and New York cases are similar in general principle, though different in detail because of the difference in legislation and the decision in the latter case will be awaited with interest.

Paving Contract Including Provision for Repair Not Legal at Milwaukee.

An opinion was rendered to the council at Milwaukee, Wis., April 20, by City Attorney Runge, in which he holds that an asphalt paving contract executed in accordance with the provisions of the Stigibauer resolution, calling for competition and a satisfactory guarantee is technicaly illegal. He is of the opinion that the requirements of the resolution placed the burden of keeping the pavements in repair, to some extent, upon the shoulders of the taxpayers, which, under the ruling of the supreme court in the Grand-ave. case is not legal. He says:

The law provides that all public work and improvements shall be awarded to the lowest competent bidder, and that before advertising for proposals for the doing of any public work it is the duty of the board of public works to file plans and specifications in its office of the work required to be done. It is the intent and purpose of the law to have as free and as much competition for the doing of public work or the making of public improvements as may be possible under all the facts and circumstances relating to the work to be done. It is, therefore, necessary that the plans and specifications should be as definite and certain as it is possible to make them, so there will be no condition nor any speculation necsary for the bidder to consider or calculate with in making his bid. If specifications are drawn embodying the provisions of the resolution referred to, there would be a condition confronting the bidder as to whether or not the bill known as 481A (referred to in the resolution) will be passed by the legislature.

The provision of the resolution which reads as follows: "That in addition to the 5 per cent. guarantee now demanded, for a further period of five years the contractor shall keep the work in repair, to the satisfaction of the board of public works at the nominal cost of 1 per cent. per square yard" would be contrary to and in violation of the law laid down by our supreme court in the case of Boyd against the city of Milwaukee and others, reported in 92 Wis. 456, where a similar provision in a contract for paving was held void and of which the court in part says: "The charter of the city of Milwaukee contains no provision for the levying of assessments against abutting property for repairs of the pavement of a street. In fact it specifically provides that the expense of maintaining and keeping in repair the street and the pavement should be paid out of the ward fund. Therefore, it was illegal to include in a contract for paving any charge for keeping in repair the pavement for a series of years. Manifestly such a charge has been included here, and in our judgment it is fatal to the validity of the assessment. * * * It is sufficient to say that it is very evident that no one in possession of good business sense will make such a contract without considering and charging for the very extended liability which he assumes of keeping the pavement in repair for five years; and thus the property-owner is compelled to pay for that which the law charges upon the ward in general. We shall not strain the language of the contract or of the law for the sake of holding a special assessment of this nature valid. All such assessments are harsh proceedings at the best and it is a salutary rule which holds the authorities making them quite strictly to the terms of the law."

Plans and specifications upon which bids for the doing of public work are received are made and become a part of the contract. I am, therefore, of the opinion that a contract entered into in accordance with the specifications containing the conditions above set forth, would be void and could not be legally carried out.

Moline, Ill., Improvements.

In his annual report to the city council H. G. Paddock, city engineer of Moline, Illinois, shows the total amount of sidewalks, pavements, water mains and sewers that have been laid in the city, together with the detailed statement of the location, date and measurement of much of the work. During the last year 4,295 lin. ft. of cement sidewalks were laid; 3,672 of water mains and 5,073 ft. of sewers constructed.

Canton, O., Improvements.

In his annual report, Phil H. Weber, city engineer at Canton, Ohio, recommends that the outlet of the Walnut-st. storm water sewer be changed to conform with the fall of Shrivers run. The total expenditures for storm water sewer construction since March, 1902, have been $143,370.97. During the year sanitary sewers have been built on seventeen streets at a cost of $10,143.99. Paving has been constructed on nine streets during the year at a cost of $19,207.77. Mr. Weber expresses the opinion that repressed block is better than wire-cut block for paving as it is more compact and less liable to chipping. He extends an invitation to the public to visit the sewage disposal works of that city and inspect their operation.

ORGANIZATIONS AND INDIVIDUALS

Electrical Engineers—National Municipal League—Technical Meetings —Personal Notes.

Local Meetings of the American Institute of Electrical Engineers.

The American Institute of Electrical Engineers has arranged for local meetings in connection with educational institutions in charge of the professor of electrical engineering or with a student society. Meetings are held at the Massachusetts Institute of Technology, Union, Lehigh, Cornell, Columbian, Cincinnati and Purdue Universities, Pennsylvania State College, Western University of Pennsylvania and the State Universities of Ohio, Illinois, Wisconsin, Missouri and Minnesota. Others will be established. These meetings are held some days after the monthly meetings of the society in New York, and are supplied with the papers and discussions presented at the meetings of the parent society. The attendants at these meetings and others interested in the study of electrical engineering can become student members of the society on certain conditions and with certain privileges which will be explained by the secretary of the society, Ralph W. Pope, 95 Liberty-st., New York.

The National Municipal League Convention.

The attendance at the opening session of the ninth annual meeting of the National Municipal League on April 22 was about thirty-five delegates.

Clinton Rogers Woodruff, of Philadelphia, secretary, in reviewing the administration of a number of cities extolled Mayor Low's administration in New York and characterized the work there of Police Commissioner Greene as remarkable and brilliant.

According to the report of Treasurer George Burnham, jr., of Philadelphia, the National Municipal League closes the year with a balance of $327.14 in the treasury, the balance of a year ago having been $692.39, the receipts for the year $3,827.30 and the expenditures $4,193.15.

J. Horace MacFarland of Harrisburg, Pa., president of the American League for Civic Improvements, read a paper on "The Federation of Civic Forces, City, State and National." Mr. MacFarland presented a proposed constitution for a civic alliance embracing a number of present organizations. Vice-President Charles Richardson read a paper on the same subject. Papers on this topic by M. Millard Palmer of Grand Rapids, Mich., and C. C. Brown of Indianapolis, Ind., were submitted.

A discussion on the subject of a civic alliance led to the adoption of the following resolution:

"Resolved, That the National Municipal League approve the suggestion of a civic alliance, and that the executive committee be authorized to take such steps as may be desirable to carry it into execution."

The societies that were considered as posible members in such an aliance were the American League for Civic Improvement; The American Park and Outdoor Association; the League of American Municipalities; National Municipal League; American Forestry Association; American Institute of Architects; League for Social Service; National Sculptors' Association; National Society of Cemetery Superintendents; National Scenic and Historic Preservation Society.

Papers on the municipal situation in a number of cities were read. One by the editor of this magazine upon the possibilities under the Indianapolis charter is commented upon in the editorial department. A strong reason for organization in securing and distributing information to voters was presented. Until the voter attends to his business of checking up his municipal officials as closely as he does the administration of his investments in a corporation he must not expect the same efficiency. He need not do this personally, but such organizations as "citizens' leagues" can be set to this work and are well worth the labor, no matter at what cost, of the most efficient and expert men who can be found to undertake it.

The paper upon the St. Louis conditions gave a full and very interesting account of the bribery cases, dividing them into four classes. One in which a street railway company franchise afterward sold at $1,250,000 was purchased for $250,000 distributed among the assembly members in sums of $3,000 to $50,000; another in which a lighting franchise worth $150,000 was purchased in the same way for $85,000; another where $135,000 in bribes was offered for a suburban franchise; and a

fourth was sought by two $2,500 offered bribes to members of the board of health. The details of the methods of exposure are interesting but too long for presentation here.

The paper on the progress of uniform accounting in Ohio by Harvey S. Chase will be considered hereafter.

Technical Meetings.

The third annual convention of the American League for Civic Improvement will be held at Chautauqua, N. Y., July 13 to 18.

The twenty-sixth convention of the National Electric Light Asociation will be held at the auditorium, Chicago, May 26, 27 and 28. James B. Cahoon, secretary.

At the meeting of the Western Society of Engineers, Chicago, April 15, Richard McCulloch, assistant general manager of the Chicago City Railway, presented a paper on "European Street Railway Practice." He compared the small mileage of street railways or tramways in European cities with American cities of the same size, stating that in Europe the street railways have followed the population, while in this country they have been built ahead of the population, with the result of establishing and developing suburban districts. The narrow, crooked streets of many of the old cities, especially in continental districts are ill adapted to the development of street railways.

The regular meeting of the American Society of Civil Engineers was held April 15. S. W. Turrill read a paper on "An Investigation of the Properties of Brick Under Different Physical Conditions." This paper was printed in the "Proceedings of the Society" for March, 1903.

The Civic Improvement League of St. Louis, Mo., has over 1,500 members. It issues frequent bulletins reporting the work of the various branches of the association and outlining further plans for individual and collective work.

The Worcester County Society of Engineers has issued an attractive program of meetings for the year, consisting of three regular meetings in Worcester, Mass., without program announcements, two lectures, an annual dinner and four excursions. The officers are Arthur J. Marble, president; Percy G. Smith, vice-president; Edward D. Woods, secretary; Arthur W. Woods, treasurer, and William H. Coughlin.

The seventh annual meeting of the American Park and Outdoor Art Association will be held in Buffalo, N. Y., July 7-9, 1903. An attractive preliminary program of papers, discussions and excursions in Buffalo and Niagara Falls has been issued by Charles Mulford Robinson, secretary, 65 S. Washington-st., Rochester, N. Y.

The winter issue of Municipal Affairs is almost entirely devoted to the papers read at the recent convention upon Municipal Ownership and Public Franchises in New York, and a stenographic report of the proceedings. It is a compendium of information on municipal ownership and operation of public utilities and well worth the price of the issue, $1. It is published by the Reform Club Committee on City Affairs, 50 Pine-st., New York.

The April announcement of the Engineers' Society of Western Pennsylvania wants a thousand members in 1903. It gives a list of about sixty-five members elected at the March meeting, and a long list of the periodicals in the library. A dinner and reception will be given preceding each meeting. At the May meeting will be presented several papers on modern materials of construction. The mechanical section will discuss power plant design at its next meeting, the structural section will consider mill building construction and the chemical section the early history of iron analysis. The society now has an employment department and announces several positions open and positions wanted.

Personal Notes.

A. V. S. Baird has been elected town clerk at Eureka, Ill.

Wallace Skutt has been elected highway commissioner at Concord, Mass.

Elmo Thompson has been elected town clerk at Kenney, Ill.

Elmer E. Piper has been appointed city engineer at Hagerstown, Md.

Martin Hayme has been elected street commissioner at Kaufman, Tex.

Herbert A. Marden has been appointed chief engineer at Portsmouth, N. H.

Virgil G. Bogue, C. E. has removed his office to 15 William Street, New York City.

H. Sweet has been appointed superintendent of water works at Ballston Spa, N. Y.

Edward M. Bigelow has been reappointed director of public works at Pittsburg, Pa.

George R. Grimes, Terre Haute, Ind., has been elected county engineer of Vigo county.

F. B. Black has been elected town clerk and Luther Stone highway commissioner at Girard, Ill.

W. J. Wetherbee has been appointed superintendent of water works at Leominster, Mass.

Michael K. Boyer has been re-elected president of the town council at Hammonton, N. J.

A. S. Dingley has been appointed city clerk at Modesto, Cal., to succeed W. A. Harter, resigned.

J. A. Foil has been elected town clerk and Fletcher Anderson commissioner of highways at Pana, Ill.

Peter E. Costello has been appointed director of the department of public works at Philadelphia.

Charles G. Roberts has been appointed a member of the board of water commissioners at Chelsea, Mass.

R. R. Parkin recently entered his sixteenth year as superintendent of the water department at Elgin, Ill.

W. E. McMullen has been elected town clerk and D. G. Way commissioner of highways at Gibson City, Ill.

James Adams has been elected town clerk and Thomas Adams highway commissioner at Taylorville, Ill.

E. H. Welch has been appointed city engineer and Charles F. Keller water superintendent at Lock Haven, Pa.

William A. Blair, at one time mayor of Asheville, N. C., was found dead in his room at the Pavilion hotel recently.

The Hon. A. J. Bradbury, recently re-elected mayor at Old Town, Me., took the oath for his second term March 29.

Benjamin D. Bartow, a well-known paving and sewer contractor of Port Huron, Mich., died April 6, aged 61 years.

Joseph P. Phillips, until recently city engineer at Scranton, Pa., has established an office at 506 Lincoln-ave., Scranton.

Dr. D. L. Edwards has been appointed town clerk at Clyde, N. Y., to fill the vacancy caused by the death of Irwin A. Forte.

Hector James Hughes has been appointed assistant professor of hydraulic and sanitary engineering of Harvard University.

V. E. Johnson has been elected town clerk, A. Froyd supervisor, and P. A. Rasums commissioner of highways at Paxton, Ill.

Arnold C. Koenig, M. Am. Soc. C. E., has been appointed water commissioner and secretary of the water board at Omaha, Neb.

J. L. Ludlow, M. Am. Soc. C. E., has been elected engineer in charge of construction of municipal water works at Columbus, Ga.

James A. Stewart, superintendent of the Utica & Mohawk Valley (N. Y.) Railway company, died March 31, at Fonda, N. Y., aged forty years.

M. G. Holmes has been appointed superintendent of the Rochester Water Company, Rochester, Minn., to succeed R. H. Mills, resigned.

W. Huddleston was elected town clerk and Willis Chick, W. Farrow, J. Cook and Harry Powers highway commissioners at Mt. Auburn, Ill.

Charles O'Malley has been elected city clerk, John F. Anderson superintendent of streets, and Elmer Folsom re-elected city engineer at Bloomington, Ill.

Joseph Laurence has been elected town clerk and H. E. Booth commissioner of highways at Litchfield, Ill. C. Anderson was elected town clerk of South Litchfield.

Charles M. Warner of the Warner-Quinlan Asphalt Company, New York City, is visiting in Mexico for the purpose of purchasing several asphalt deposits near Tampico.

Maj. S. W. Finley, county surveyor of Orange county, California, has been elected president of the board of trustees at Santa Ana. Maj. Finley was formerly city engineer of Santa Ana.

John B. Hawley has been elected city engineer, Charles Crabtree city electrician, Capt. A. W. Scoble superintendent of water works, and J. W. Renfro street commissioner at Ft. Worth, Tex.

J. Y. McClintock, M. Am. Soc. C. E., has resigned his position as commissioner of public works, Rochester, N. Y. He is succeeded by Thomas J. Neville, who was deputy commissioner under him.

Edward D. Roch has been appointed city engineer at Summit, N. J. He was formerly connected with the engineering department at Syracuse, N. Y., and until recently was assistant city surveyor at Utica.

E. Steelman Royal, who was sworn into office as city clerk of the new city of Ventnor, N. J., April 14, is the youngest city clerk of the youngest municipality in the state of New Jersey, being only twenty-two years of age.

Judge George Hillyer has resigned his position as president of the board of water commissioners at Atlanta, Ga. He will be succeeded by Vice-President George W. Harrison, who will be succeeded by Frank P. Rice.

William C. Andrews of New York City, who has for two years been associate editor of the "Street Railway Journal," has accepted a position as eastern representative of E. P. Roberts & Co., consulting engineers, Cleveland, O.

J. U. Fritchey, Lancaster, Pa., has taken G. M. Fritchey in partnership in his business, and the firm name is now J. U Fritchey & Son. G. M. Fritchey has acted in the capacity of paymaster for J. U. Fritchey for the last six years.

City engineers have been elected as follows: James F. Fisher, Williamsport, Pa.; D. H. Sawyer, Paris, Ill.; Emmett C. McAnelly, Ft. Collins, Col.; J. W. Crook, Paris, Tex.; J. Ross Robertson, Keokuk, Ia.; Elmer H. Beard, Reading, Pa.; Fred Giddings, Atchison, Kas.

S. G. Gano has been appointed to make complete topographical and property maps of the entire city of Newcastle, Pa. Mr. Gano has resigned his position as assistant engineer on the Buffalo, Rochester & Pittsburg railway, which he has held for the past five years, for the purpose of doing this work for the city. He will begin the surveys at once. Three years will probably be required to complete it.

Francis C. Tucker and George S. Hopkins well known in their connection with the city engineering of Deadwood as well as by their large civil and mining engineering practice, have associated with themselves Eldo L. Wooley and Edward J. Robinson to form the Black Hills Engineering Company with offices in the postoffice building at Deadwood, S. D.

Mr. Barney H. Sanders, who has been with the Pleuger & Henger Mfg. Co. of St. Louis since the organization of the

company, has become secretary and general manager of the company since the retirement of Mr. Pleuger early in the present year. The company recently received the contract to furnish 400 of their National hydrants, St. Louis pattern, to the city of St. Louis, the contract being awarded in competition with bidders from all over the country. Mr. Sanders, early in April, started on an extended business trip through the West and Northwest. He called on most of the water companies and city officials in the interests of his company.

Mayors have been elected during April as follows: William F. Rock, Urbana, O.; Charles E. Jackson, Rockford, Ill.; Dana Sargent, Nashua, N. H.; Jacob H. Beatty, relected, Hackettstown, N. J.; Tom Johnson, re-elected, Cleveland, O.; Henry Mueller, Butte, Mont.; John Frinke, Anaconda, Mont.; L. L. Brown, Winona, Minn.; A. A. Poebler, Henderson, Minn.; J. M. Learn, Litchfield, Minn.; F. H. Register, Bismarck, N. D.; Andrew J. Diamond, Keokuk, Ia.; B. O. Vale, Willmar, Minn.; Dr. J. A. Dubois, Saulk Centre, Minn.; Dr. J. F. Milligen, Wabasha, Minn.; J. H. Termatch, Lesueur, Minn.; M. E. Matthews, Marshall, Minn., E. J. Webber, Fergus Falls, Minn.; Archibald J. Scott, Houghton, Mich.; Judge Silas Cook, East St. Louis, Ill.; George Morrison, Bloomington, Ill.; Harry Devereaux, Springfield, Ill.; Robert H. Jeffrey, Columbus, O.; J. N. Sampson, Adrian, Mich.; Dr. F. E. Palmer, Albion, Mich.; A. Brown, Ann Arbor, Mich.; F. H. Webb, Battle Creek, Mich.; F. T. Woodworth, Bay City, Mich.; R. B. Gillette, Benton Harbor, Mich.; E. J. Newcombe, Big Rapids, Mich.; James McGregor, Cheboygan, Mich.; A. J. Lacey, Clare, Mich.; W. D. Jones, Dowagiac, Mich.; Dr. Long, Eaton Rapids, Mich.; J. J. Sourwine, Escanaba, Mich.; C. K. Hoyt, Grand Haven, Mich.; Archibald J. Scott, Hancock, Mich.; L. A. Goodrich, Hillsdale, Mich.; —— Frenodorf, Hudson, Mich.; W. A. Harris, Hastings, Mich.; A. J. Derow, Holland, Mich.; John F. Bible, Ionia, Mich.; E. A. Nuber, Iron Mountain, Mich.; Mr. Pickles, Jackson, Mich.; S. Folz, Kalamazoo, Mich.; Dr. Blake, Lapeer, Mich.; W. A. Carter, Ludington, Mich.; Dr. F. M. Foote, Marshall, Mich.; W. Greene, Marquette, Mich.; Elias Culver, Mason, Mich.; W. Holmes, Menominee, Mich.; W. E. Wente, Manistee, Mich.; J. Martin, Monroe, Mich.; Dr. A. A. Parisot, Mt. Clemens, Mich.; H. E. Denel, Mt. Pleasant, Mich.; L. Eyke, Muskegon, Mich.; C. R. Smith, Niles, Mich.; Dr. A. L. Arnold, Owosso, Mich.; G. E. Raycraft, Petoskey, Mich.; H. C. Guillot, Pontiac, Mich.; James L. Lepsett, Sault Ste. Marie, Mich.; S. E. Dykeman, South Haven, Mich.; J. W. Inches, St. Clair, Mich.; J. V. Starr, St. Joseph, Mich.; E. Schlechte, Tawas City, Mich.; J. R. Sants, Traverse City, Mich.; C. R. Huston, Ypsilanti, Mich.; Warren Onley, Oakland, Cal.; Thomas B. Gilbert, Kansas City, Kas.; W. S. Bergundthal, Topeka, Kas.; B. F. McLean, Wichita, Kas.; D. R. Anthony, jr., Leavenworth, Kas.; A. B. Selig, Lawrence, Kas.; J. P. Harshu, Hutchinson, Kas.; John E. Martin, Emporia, Kas.; James M. Orr, Atchison, Kas.; Carter H. Harrison, Chicago, Ill.; J. H. Spencer, Murrayville, Ill.; Philip Flood, Girard, Ill.; W. J. King, Litchfield, Ill.; Joseph Lambert, Metropolis, Ill.; Paul W. Truson, Lincoln, Ill.; Thomas H. Koch, Mount Olive, Ill.; C. J. Dittmar, Freeport, Ill.; E. N. Woodruff, Peoria, Ill.; C. F. Shilling, Decatur, Ill.; J. W. Conzelman, Pekin, Ill.; John Beard, Danville, Ill.; E. C. Swigart, Farmer City, Ill.; H. Well, San Jose, Ill.; Dr. N. Holmes, Delavan, Ill.; H. J. Puterbaugh, Mackinaw, Ill.; David Bradley, Miner, Ill.; H. F. Reason, Mason City, Ill.; D. B. Meek, Eureka, Ill.; M. S. Street, Wenona, Ill.; S. A. Rathbun, Pontiac, Ill.; R. Cruzen, Paxton, Ill.; H. B. Meils, Minonk, Ill.; Jacob Roth, Gibson City, Ill.; N. H. Green, Tallula, Ill.; E. A. Agard, Fairbury, Ill.; E. I. Swigart, Champaign, Ill.; H. C. Keil, Beardstown, Ill.; A. J. Gibbons, Metropolis, Ill.; H. N. Schuyler, Pana, Ill.; J. H. Wilson, McLeansboro, Ill.; William C. Crotins, Joliet, Ill.

MACHINERY AND TRADE

A New System of Concrete-Steel Construction—The Weber.

The Weber system of steel concrete construction for which patents were issued November 4, 1902, was devised by Mr. Carl Weber, formerly of St. Louis, but now residing in Chicago. He is a native of Germany, an engineer by profession and the system of steel concrete construction bearing his name is the result of years of experience and study in this class of construction, in which he was engaged in his native country. His system consists of the use of steel T bars, the size of the bars depending upon

the character of the structures, which are fastened by a galvanized clamp, also covered by his patents.

The system is controlled by the Steel Concrete Construction Company of Chicago, organized under the laws of Maine with a capital of $1,000,000. Under the laws of Maine there can be no treasury stock. The stock of the company has been underwritten by a syndicate which guarantees to furnish the necessary capital for a period of three years, regardless of the income.

The patents of the company are genuine and cover the use of T bars of every description and the clamp in all forms for concrete construction. Mr. Carl Weber, the inventor of the system, is chief engineer and president of the company, Mr. H. C. Gray is secretary and Mr. Geo. P. Heehel is general manager.

In its illustrated pamphlet describing the system the company has the following to say:

This system differs from others by using in the formation of the steel skeleton "T" steel bars of small profile, from ¾x¾ inches to 2x2 inches and heavier, as the purpose and strength of the respective structures may require.

These T steel bars, when incased in the completed steel-concrete work, form inside a network of larger or smaller meshes, according to the distance at which the bars are placed, which entirely depends upon the intent and purpose as well as the required strength of the structure.

For the connection of the steel bars properly shaped galvanized tin clamps are used, supplanting the old and laborious style of tying the bars with binding-in wire or hoop-iron.

The great advantages of this system are at once apparent, and are specifically as follows:

The T steel bars offer the concrete a 2 to 2½ times larger joining area than round or square steel bars of equal weight and have greater power of resistance to the force of bending at a comparatively higher limit of elasticity.

The erection of the steel skeleton is very much simplified by the use of the clamps, as they can be fastened on the bars with specially shaped pincers with a single pressure, whereby one man can in a given time make more connections with them, than six men could by the older systems.

These connecting clamps fulfill the double task of making the careful preparatory erection of the steel skeleton possible, and also, to keep the separate bars in the desired position until the form is filled in with concrete.

When the concrete is once hardened, then the displacing of the bars is of course impossible, and the object of the clamps is fulfilled.

Illinois Steel Company's New Portland Cement Plant.

The Illinois Steel Company has just purchased a site in Lake county, Indiana, and construction has been commenced on a plant for the manufacture of Portland cement, the cost of which will ultimately be $3,000,000. Plans as they have now been prepared and on which work is under way involve an immediate expenditure of $1,500,000; but with the increased output the company will not be able to meet the demand for its product.

The site comprises a tract of 33 acres near Indiana Harbor, Ind.

The works will be known as the Buffington plant. The plans provide for a plant with a capacity of 4,000 barrels a day. The buildings include a raw material building, 180 by 130; burner building, 120 by 240; finishing mill, 70 by 240; storage warehouses, two buildings, each 120 by 350, with a capacity of 40,000 barrels of cement.

In addition to the foregoing there will be a machine shop and various miscellaneous structures. The buildings will be constructed largely of cement and steel, and will be equipped with the most modern machinery. The plant is to be completed by April 1 of next year, at which time it will go into operation, giving employment to 400 to 500 men.

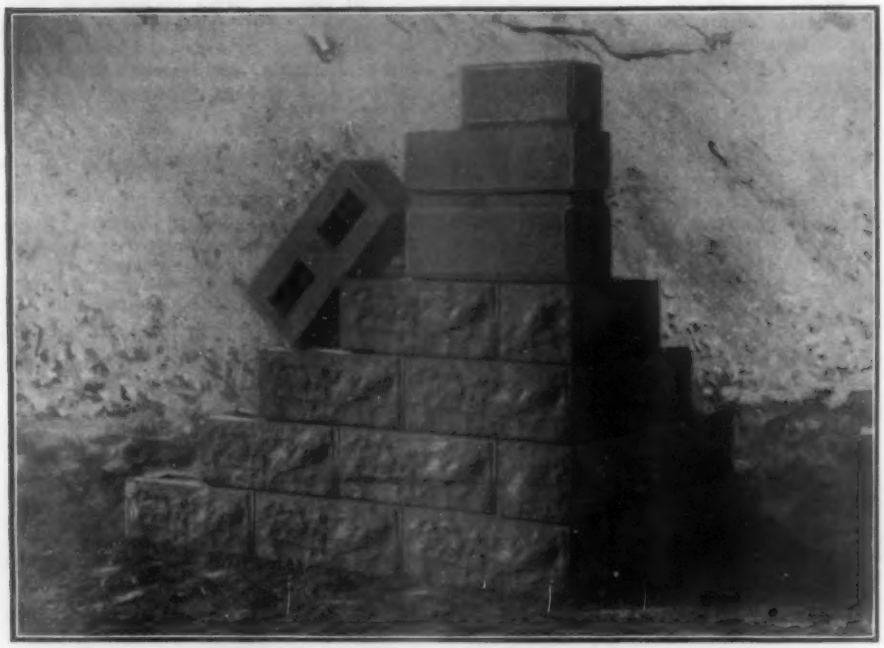
The company began the manufacture of Universal Portland cement in 1900. As is well known it is made from slag and limestone. It constructed in connection with its south works a plant with a capacity of 2,000 barrels a day. The use of cement has increased so rapidly that the company could now dispose of 10,000 barrels a day, were it possible to produce it.

In addition to the two plants in Chicago the United States Steel Corporation has also begun the construction of a plant at the Carnegie works at Pittsburg. The mill at that place will have a capacity of 2,000 barrels a day of Universal Portland cement and will cost $800,000. When the mills now under way are completed the output per day (barrels) will be:

Buffington plant	4,000
South works, South Chicago	2,000
Carnegie works, Pittsburg	2,000
Total	8,000

A Simple Concrete Block Machine.

In the advertisement of the Seamans Hollow Concrete Block Machine in this number of Municipal Engineering will be found a photograph showing the simplicity of his machine, the ease with which the blocks are handled and the compact manner in which they can be stored. The accompanying photograph shows some of the various forms of block which can be made on a machine. Many forms of partial blocks can also be made in it. In Mr. Seaman's catalogue will be found a series of pictures showing the process of making a block, of removing the machine from the finished blocks, of lifting the blocks to the pile after the machine has been removed and set ready for another pair of blocks at the same time. It is said that 300 small blocks or 200 large ones can be turned out in a 10-hour day. Mr. E. W. Seaman, 97 Ottawa street, Grand Rapids, Mich., should be addressed for copies of the catalogue.



SEAMAN'S HOLLOW CONCRETE BLOCKS.

Suits on Hollow Block Patents.

A circular reproducing photographically an article in the Brooklyn Eagle of March 2, 1903, with additions of specific names, has been received, which states that the Patent, Tile and Guarantee Company of 150 Broadway, New York, has just brought suit against N. F. Palmer of Brooklyn, N. Y., for infringing the patents of Harmon S. Palmer for machines for molding hollow concrete blocks, which patents are now owned by the Harmon S Palmer Building Block Company of Washington, D. C., and are being protected by the above company, as well as the Pacific Patent Protection Company of San Francisco, Cal., Mr. Harmon S. Palmer being the original inventor and pioneer of this method of concrete building, which is now known throughout the United States. Suits have also been started in the United States Court at Detroit, Mich., against Normandin and W. F. Cowham of Jackson, Mich., for similar infringements.

In an article published in the Brooklyn Eagle some time since a reward was offered for information that would lead to the discovery of parties infringing the patents which cover the fundamental principles of molding hollow concrete building blocks, and the result was information on which suits in the United States court were at once started.

This circular was received April 25, 1903.

A circular has been received from Noyes F. Palmer of Brooklyn, N. Y., containing a letter from William Van Wyck, an attorney in Brooklyn, in which he

makes the following statements under date of March 23, 1903: "This is to certify that I have searched the records of the United States district court and the United States circuit court, kept by the clerks of those courts in their offices, in the Borough of Brooklyn, county of 1, 1897, and find that no suit, writ, petition or proceeding of any kind has been entered, filed or docketed in either of the courts to date, against either Noyes F. Palmer, or the Noyes F. Palmer Manufacturing Company. I also hereby certify that there is no record in either of the said clerks' offices since Jan. 1, 1897, to date, of any suit for infringement of any patents or rights brought against Noyes F. Palmer or Noyes F. Palmer Manufacturing Company. I have also made inquiries and searches elsewhere and fail to obtain any information of any suit having been brought or even contemplated against Noyes F. Palmer or the Noyes F. Palmer Manufacturing Company, respecting any infringement of patents or rights anywhere."

Trade Publications.

Julian Scholl & Co. have issued catalogue No. 23, showing their asphalt steam rollers of all sizes from two and one-half tons to twelve tons, asphalt and concrete mixers, fire wagons, melting kettles, hand surface rollers, stone crushing outfit and road scarifier. The main offices of the firm are at 126 Liberty-st., New York.

The Acme Road Machinery Company of Frankfort, N. Y., sends a catalogue of road building machinery, including rock crushers, elevators, screens, portable bins, road machines, dump wagons, cars and carts, spreading wagon, plows, barrows, rollers, horse and steam, bridges, tanks and sprinklers, street sweepers, bag and can carriers, brooms, pumps, jacks, winches, graders, levelers and scrapers, sewer tile, contractors', quarrymen's and township supplies.

The Studebaker Sprinkling Wagons are shown in the usual handsome style of the Studebaker Bros.' Manufacturing Company in their catalogue, No. 217. The factory is at South Bend, Ind. The catalogue also includes harness, street sweeping machines and dump wagons.

The Pittsburg Meter Company of Pittsburg, Pa., issues a pamphlet singing the praises of its gas meters to the extent warranted by fifty-four car loads in six months.

The 1903 catalogue of the Saginaw Paving Brick Company of Saginaw, Mich., shows its clay and shale banks, kilns and numerous streets laid and buildings constructed of its product. The various styles of brick manufactured are also illustrated.

The intermittent flush tanks of the Pacific Flush Tank Company of 84 La Salle-st., Chicago, Ill., are shown in a handsome catalogue which also contains a testimonial from some user in each state and territory.

The Noyes F. Palmer Manufacturing Company is distributing a circular regarding reported suits for infringement of patents. Their address is 150 Snediker-ave., Brooklyn, N. Y.

Our readers who have been asking for information about presses for making tile and various forms of blocks of cement, asphalt and lime and sand will be interested in the large and well-illustrated catalogue of George Wittmer, Karlsruhe in Baden, Germany.

Trade Notes.

ASPHALT.

Valuable beds of asphalt have been discovered about one mile from Mt. Vernon, Ky., according to press reports.

About 440,000 acres of coal and asphalt lands in Indian territory will be sold at auction within the next two years, according to the report of the secretary of the interior.

A report on the extent and quality of the Kentucky asphalt fields along Green River is being prepared for the McCann, Fitch & Converse Co., of Edinburg, Scotland, by Prof. J. F. Elson, of New Albany, Ind. The report is to be used by the firm as a basis preliminary to making investments in the Kentucky field.

The asphalt paving repair plant for which patents were granted to F. A. Hetherington, of Hetherington & Berner, in the year 1899, is now being rapidly pushed to completion by that company. Owing to the fact that the facilities of the company have been so fully taxed since the little plant was invented its construction was not begun until the latter part of 1902. It is the purpose of the company to subject the plant to severe tests of practical operation before offering it to the trade. After these tests are completed the plants will be built in lots of six and purchasers will be able to obtain one on order at any time. The Hetherington railway asphalt plant is being redesigned and the new model will embody the results of experience gained with these well known plants during the past. Many new features will first appear in the new model.

BRICK.

O. M. Stafford of the Eastern Paving Brick Company, Poughkeepsie, N. Y., has purchased the plant of the Catskill Shale Brick Company, Catskill, N. Y.

W. E. Vandervort of Millbank, S. D., is forming a company for the manufacture of paving and other brick.

W. Q. Wallace & Sons have purchased a brickyard and extensive shale beds ad-

joining it northwest of Macon, Mo., and will establish a vitrified brick plant.

The Muskogee Vitrified Brick Company, Muskogee, Ind. T., has been incorporated by W. H. Patterson, J. Lee Dabbs and others. A plant will be erected at once.

The Table Rock Vitrified Brick & Paving Company, Table Rock, Neb., has passed into the hands of the Cotton Brick Company, composed of George Cotton, E. P. Bracken and H. G. Ward.

The Bamberger Brick Company, Salt Lake City, Utah, has been purchased by the Improved Brick Company. It is estimated that the output this year, including pressed, wire-cut and other brick, will be 25,000,000.

The Baltimore Vitrified Clay Company, Baltimore, Md., has purchased 123 acres of land in South Baltimore and a large plant for the manufacture of paving brick will be erected at a cost of more than $100,000. J. K. Bartlett is president and Edward J. Bond is treasurer of the company. The company expects to have the plant in operation by July 1.

CEMENT.

W. J. Faus, Montevideo, Minn., has begun the construction of cement sidewalks.

The Virginia Sand and Gravel Co., Portsmouth, Va., has been incorporated.

The Diamond Cement and Lithograph Stone Co., New York City, has been incorporated.

John Jordan of Minneapolis, Minn., will establish a cement sidewalk plant at Mandan, N. D.

A cement sidewalk factory will be opened at Crookston, Minn., by Charles Fahlberg and Mr. Hallum of St. Paul.

The Carolina Portland Cement Company of Birmingham, Ala., contemplates moving its main offices to Atlanta, Ga.

The Superior Portland Cement Company, Superior, Neb., expects its plant to be completed and ready for occupancy by May 1.

The Progressive Lime and Cement Co. has been incorporated at Natchez, Miss., by Maurice Moses, John B. Reber and Israel Moses.

The Standard Cement company has been incorporated at Toronto, Ont., by Daniel Urquhart, George Wilkie and W J. Marshall.

A plant for the manufacture of natural hydraulic cement is proposed at Cameron City, Col., by Conrad Meyer and S. I. Van Buskirk.

The Palatine Portland Cement Company has been incorporated in Michigan and will operate in Genesee, Livingston and Shiawassee counties.

The Belleville Portland Cement Company, Belleville, Ill., has awarded the contract for the stonework on its plant to Manly & Pippen for $35,000.

The Buxton Pump and Iron Works, Nashville, Tenn., has been incorporated with officers as follows: President, A. C. Buxton; treasurer, C. A. H. Hough.

T. E. Peters, White Wood, S. D., desires to correspond with parties looking for a site for a Portland cement plant, as he has a good opening for one.

The Ohio Stone Paving Co., Youngstown, O., has been incorporated by William T. Gibson, William Tod, James T. Gibson, French Clingen and Lewis Gibson.

The Chulasky Iron and Cement Co. has been incorporated under the laws of Delaware by Robert E. Carter, Hazleton, Pa.; David S. Price, Clark's Summit, Pa.; Alfred L. Derry, Scranton, Pa.

The Atlas Portland Cement Company has filed papers with the secretary of state at Jefferson City, Mo., according to press reports, in order to secure license to begin the manufacture of cement in Missouri.

The National Cement company has been incorporated at Phillipsburg, N. J., and will erect a cement plant at Stewartsville, N. J. The incorporators are: A. H. Bigelow, Stewartsville; G. Wyckoff, Cummins; Morris Maust, Belvidere.

The Alpena Portland Cement Company of Alpena, Mich., submitted the lowest bid for furnishing 6,000 barrels of Portland cement for use in the construction of the new concrete breakwater at Marquette, Mich. The company's bid was $2.30 a barrel.

The Logansport Artificial Stone Co., Logansport, Ind., has been incorporated to manufacture the Palmer Hollow concrete block, with officers as follows: President, William B. Smith; secretary and treasurer, Charles O. McCormick; superintendent, Robert Miller.

Leases have been secured on a quarter section of land in Independence, Kas., and a second cement plant will be erected. Work will begin on the plant at once, which will be located southwest of Independence on Rock Creek. An Eastern syndicate is interested.

The Jerome Brick and Cement Company, Ltd., Marshall, Mich., was incorporated April 17 with the following officers: President, Jay Chandler of Jerome; treasurer, W. P. Miner of Battle Creek; secretary, Henry Rupert of Battle Creek; general manager, Robert J. Moreland of Jerome.

The capacity of the Peninsular Portland Cement Company, whose plant is at Cement City, Mich., will be doubled. The new directors have chosen officers as follows: President, C. A. Newcomb, Detroit; vice-president, W. H. Niblack, Decatur, Ind.; secretary and general manager, W. F. Cowham; treasurer, N. S. Potter.

LIGHTING AND POWER.

The establishment of a plant for the manufacture of vapor lighting and heating plants is contemplated at Fargo, N. D.

A company is being organized in Des Moines, Ia., to establish a hot water heating plant in one of the residence districts.

The Central Electric and Manufacturing Company, Youngstown, O., recently incorporated under the laws of Delaware, will erect a plant at once at Struthers and will manufacture electrical apparatus.

The Economic Lighting Company, Norfolk, Va., has been incorporated to man-

ufacture and supply light and heat by means of electricity. The officers of the company are: President, Samuel B. Lawrence, New York City; secretary, Henry C. Everett, New York City; treasurer, John B. Summerfield, New York City.

Newly incorporated electric light and gas companies: Girard Gas Company, Girard, O.; Struthers Gas Company, Struthers, O.; Niles Gas Company, Niles, O.; Youngstown Light and Fuel Company, Youngstown, O.; United States Lighting and Traction Company, Washington, D. C.; Northern Jersey Light, Heat and Power Company, Newark, N. J.; Faribault Gas and Electric Company, Faribault, Minn.; Ft. Smith Light and Traction Company, Ft. Smith, Ark.; Converse Electric Light Company, Converse, Ind.; Merchants' Mutual Company, Beaumont, Tex.; Raleigh Gas Company, Pendleton, Ind.; Mt. Gilead Water, Light, Heat and Power Company, Mt. Gilead, O.; Illinois Railway and Light Company, Jersey City, N. J.; Mt. Holly Springs Light, Heat and Power Company, Mt. Holly, Pa.; Economic Lighting Company, Norfolk, Va.; Century Light, Heat and Power Company, Jersey City, N. J.; Empire Light, Heat and Power Company, Jersey City, N. J.; Maumee Electric Company, Maumee, O.

MISCELLANEOUS.

N. Nelson, Northfield, Minn., will remove his cement sidewalk business to Ashland, Wis.

The Brookings Cement Block and Sidewalk Company, Brookings, S. D., has been incorporated.

The Stone Mfg. & Bldg. Company, Des Moines, Ia., will build a concrete stone factory at Huron, S. D.

The Ricker-Bratnober Stone Company, Waterloo, Ia., will establish a concrete stone plant at Dubuque.

Miracle & Miracle, Sioux Falls, S. D., will erect a plant at Watertown, S. D., for the manufacture of cement blocks.

The American Vitrified Stone and Concrete Company, Waverly, N. Y., has been incorporated to manufacture artificial stone. Geo. F. Stanton, Manager.

The San Francisco & San Joaquin Coal Company of San Francisco, Cal., has decided to install machinery for the briqueting of coal dust.

The Concrete Granette Company, East Orange, N. J., has been incorporated to manufacture artificial stone, by Joseph Gerradt, Edward F. Magaffin and Emory W. Ulman.

The board of trustees of Riverside, Cal., will grant a fifty-year franchise May 12 for maintaining and operating a single or double-track electric railroad. C. R. Stibbens, cy. clk.

The Dominion Paving & Construction Company will erect a plant in Vancouver, B. C., for making its carbolite and carbolineum wood preserving compounds and creosote in all colors.

The Benson Concrete Stone Company, Benson, Minn., has been incorporated with officers as follows: President, Ira C. Gilman; vice-president, Elden J. Cork; secretary and treasurer, Alva A. Andrews.

The Berne Artificial Stone Company, Berne, Ind., is being organized by H. S. Michauel, Philip Schugg, Frud Neaderhauser, C. L. Simkins, Christ Stengel, Amos Rensier and David Augsburger.

The Southern Construction Company Orange, Tex., has been incorporated to construct railroads and bridges for railroad companies, by L. Miller and C. Beuhler, of Orange, and W. R. Lewis of Bay City.

The Worthington Pump Company has been incorporated in London, Eng. The company acquires the European business of the Worthington, Blake and other companies, and two factories will be built, one in Germany and one in Russia.

The Waterloo Concrete Stone Company of Waterloo, Ia., contemplates building 15 or 20 factories in Iowa. The first one will be built at Fort Dodge. Cherokee and Oskaloosa are also favored points. E. C. Litchfield has been made general manager. The company already operates four factories and quarries.

The Glen Rock Company, Syracuse, N. Y., has been incorporated and has secured options on sixty-five acres of land at and near Jamesville to quarry limestone. The directors of the company are E. L. Calkins of Solvay, W. A. Beattie, E. L. Loomis, H. E. Miller, J. G. Sherman and C. H. Wilcox of Syracuse and P. Howe of New York City.

The Cooley Epicycloidal Engine Company has been incorporated at Trenton, N. J., to acquire the Cooley patent rights pertaining to rotary fluid motors, meters and pumps. The incorporators are Chas. S. Farquhar, Geo. S. Taft, John F. Cooley, Wm. C. Grey, Edward A. Phippen, D. A. Farquhar and H. W. Longfellow of Boston and Matthew E. Gatley of Waltham, Mass.

Plans and specifications for a 300-ton crushing plant for the Western Realty and Paving Company, Denver, Col., have been completed by Bonunevie & Lee. The machinery includes one Sturtevant steel crusher, 11 by 26 inches, and one 6 by 16 inches; one continuous bucket iron elevator; two 36-in. by 10-ft. revolving screens; one 16-ft. by 66-in. boiler; one 60 horse-power engine; one 14 by 16 by 22-in. Rand drill air compressor.

The Watson Wagon Company, Canastota, N. Y., awarded a contract April 14 to Swart & Fancher for a three-story addition to its plant in West Center. The addition will provide about 10,000 feet of floor space, and $4,000 worth of new machinery will be installed in the plant.

The Jones-Hogue Company of Indianapolis, Ind., has been incorporated to do electrical and mechanical engineering and construction work of railway, heat, light and power plants. The incorporators are H. Whitford Jones, of Cleveland, O.; L. L. Green, E. E. Elliott, Indianapolis; A. B. Hogue, Geo. A. Saylor, Geo. A. Hogue, Greenwood. H. Whitford Jones is president.

At the last meeting of the board of directors of the Allis-Chalmers Company, held in New York April 15, the regular quarterly dividend of 1¾ per cent. was declared on preferred stock. The volume of business on the books of the company

today far exceeds that of any time since the organization of the company, notwithstanding the fact that the output of the plants has been increased to a large extent. There is no abatement of prosperity in their various branches of manufacture. There seems to be an unlimited demand for all kinds of high-grade machinery, which is certainly a good indication that prosperity is enjoyed in all lines of manufacture.

SEWER PIPE.

A company is being organized at Sharon, Pa., to build tile sewer works.

The Apollo Fire Brick Company, Kittanning, Pa., has been incorporated to manufacture brick, tile, terra cotta and sewer pipe.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

Mankato, Minn. — (Special.) — J. R. Thompson, cy. engr., says the supreme court refused a rehearing of the paving case, and as yet nothing further has been done.

CONTEMPLATED WORK.

streets is contemplated.

Bushnell, Ill.—About fifteen blocks of paving is contemplated this summer.

Woonsocket, R. I.—Clinton-st. will be paved with bitulithic macadam.

Grand Forks, S. D.—The construction of cement sidewalks is proposed.

Marietta, O.—An ordinance has been adopted for paving Church-st.

Goshen, N. Y.—The bd. of supvrs. has decided to construct portions of four roads.

Newman, Ill.—About $8,000 will be expended in building concrete walks this spring.

Quincy, Ill.—Brick paving is proposed for Park-place, between Twelfth and Fourteenth-sts.

Shenandoah, Ia.—Mayor Cotrell is agitating the question of paving.

Jacksonville, Fla.—Asphalt paving is proposed for Hogan-st. along Hemming park.

Walla Walla, Wash.—Paving is proposed for two streets. R. P. Reynolds, cy. clk.

Champaign, Ill.—Paving is proposed for University-ave., from Romaine to Race-sts.

Lansing, Mich.—The council is considering petitions for paving Allegan-st. and Capitol-ave.

Oshkosh, Wis.—The property owners on upper Algoma-st. have asked for asphalt paving.

Providence, R. I.—This city is considering the question of bitulithic macadam paving.

Portsmouth, R. I.—The question of macadamizing Sandy Point road will be voted on May 6.

Westfield, Mass.—An appropriation of $25,000 has been provided for highways, macadam, etc.

Muncie, Ind.—The Commerical Club will consider the question of paving at a public meeting.

St. Paul, Minn.—Granite paving for E. Third-st. and asphalt for University-ave. is proposed.

Jersey Shore, Pa.—The question of issuing bonds for street paving will be voted on May 16.

Rochester, Minn.—A brick road on Zumbro-st., from Main-st. to St. Mary's hospital, is proposed.

Attica, N. Y.—Favor-st. will be macadamized its entire length and cement sidewalks constructed.

Milwaukee, Wis.—Bitulithic macadam paving is proposed on Van Buren-st., from Juneau-ave. to Knapp-st.

Lake Charles, Ia.—The property owners on Ryan-st. have petitioned for 1 mile of brick or asphalt paving.

Moline, Ill.—An ordinance was passed April 20 for paving a number of streets with brick and asphalt.

New Albany, Ind.—The city council ordered, April 20, the improvement of thirteen miles of street with asphalt.

Hallettsville, Tex.—The question of issuing $25,000 bonds for roads and bridges will be voted on May 2.

Somerville, N. J.—The board of aldermen has made an appropriation for highways, sidewalks and crossings.

Savannah, Ga.—Ordinances have been introduced for paving Whitaker and W. Broad-sts. with vitrified brick.

San Francisco, Cal.—The city engineer has recommended paving and repaving for a large number of streets.

Belleville, Ill.—Plans and specifications for paving W. Main-st. are being prepared by City Engineer Graner.

Seattle, Wash.—Vitrified brick, asphalt or bitulithic pavement is proposed for Broadway from Yesler to Roy.

Columbus, O.—Ordinances have been recommended for passage for paving Second and Hildreth-aves. and Beck-st.

Scranton, Pa.—Paving is proposed for Pittston and Cedar-aves., on the south side, according to press reports.

Atlantic City, N. J.—Ordinances were passed April 17 authorizing the issue of $5,000 bonds for paving sidewalks.

Leavenworth, Kans.—The government has decided to replace the miles of brick walks in the post with granitoid.

Perth Amboy, N. J.—An ordinance has been introduced to pave Smith-st. with asphalt. John F. Riley, cy. clk.

Cement sidewalks are proposed in Armour, S. D.; Starbuck, Minn.; San Bernardino, Cal.; Tacoma, Wash.; Springfield, O.

Albany, Mo.—A resolution has been adopted for paving the streets around the public square with vitrified brick.

Galveston, Tex.—Strand, Twenty-second and Twenty-fifth-sts. will be paved with brick on a concrete base. G. G. Wells, cy. engr.

Denver, Col.—The board of public works is preparing estimates for paving Montview boulevard with disintegrated granite.

Oneida, N. Y.—The property-owners on Broad-st., between Chestnut and Grove, have petitioned for brick or asphalt paving.

Ithaca, N. Y.—The residents on S. Geneva-st., from Greene to Clinton, have petitioned for block or macadam paving.

Permanent walks are proposed in Winterset, Ia., Green Lake, Wash., Birmingham, Ala., Crookston, Minn., Pratt City, Ala.

East Lake, Ala.—The question of issuing bonds for street improvements will be voted on May 16. Mayor and bd. of aldermen.

Redlands, Cal.—The city trustees will ask for bids for paving Fourth, Fifth, E. State and E. and W. Citrus-aves.

Oshkosh, Wis.—An ordinance has been introduced for paving Main and Jackson-sts. and Franklin-ave. with asphalt. Mayor Mulva.

Duluth, Minn.—Council has referred to the board of public works the petition for paving Lake-ave., Fifty-fifth-ave., W., and Superior-st.

Streator, Ill.—Paving is proposed for Lundy-st., from Bloomington to Vermillion and LaRue from Bloomington to Van Buren.

Shreveport, La. — (Special.) — Wilkie Woodward, city engineer, estimates the cost of the proposed street paving in this city at $449,647.65.

Duluth, Minn.—City Engineer Patton has nearly completed estimates on the different kinds of pavements requested recently by the city council.

Denver, Col.—A petition has been secured for paving over two miles of boulevard F, from the Fourteenth-st. viaduct to Harkness Hights.

New Castle, Ind.—Petitions have been submitted asking for cement walks grading and graveling on Seventeenth and Eighteenth-sts., between A and I-aves.

Duluth, Minn.—Petitions have been submitted to council to pave Superior-st. and Lake-ave. Sandstone block paving is desired for the latter.

Memphis, Tenn.—The tax budget has been passed. It calls for $150,000 for the engineering department to be expended for streets and bridges.

Baltimore, Md.—Ordinances were passed April 17 for paving and repaving with asphalt blocks, macadam and cobblestones a number of streets.

Kansas City, Mo.—The repairing or repaving of Main, Wyandotte, Delaware and Walnut-sts. in the business district is proposed. Mayor Reed.

Monroe, Mich.—The question of issuing $32,000 bonds for extending the pavement on Front-st. to the Pere Marquette depot will be voted on May 4.

Houston, Tex.—The citizens' committee has asked for permission to lay sample blocks of street paving, subject to the approval of the city engineer.

Findlay, O.—An ordinance has been adopted for paving W. Crawford-st., from Main to Liberty, and to construct sidewalks on both sides of Walnut-st.

Voted to Issue Bonds—Albion, Mich., $25,000 paving bonds; Battle Creek, Mich., $10,000 paving bonds; Cadillac, Mich., $35,000 improvement bonds.

St. Joseph, Mich.—(Special.)—Bids will be asked soon for paving Clinton-ave., from Ross to State-st., with brick on concrete. E. J. Bullard, prest.

Waukesha, Wis.—Plans and specifications for paving Barstow-st., from the bridge to the Milwaukee railroad tracks, with brick have been adopted. Mayor Harding.

Utica, N. Y.—The common council has decided to award contracts for paving work this year by May 1, if the plans and specifications can be completed by that time.

Geneva, N. Y.—Petitons have been submitted for paving Putney, Castle, N. Exchange, Cherry, Lake and Exchange-sts. with macadam and Bradford-st. with Medina stone.

Baraboo, Wis.—The town has voted a one mill tax to be added to the $1,000 furnished by the county for the purpose of making permanent road improvements.

Fort Plain, N. Y.—The town board visited Schenectady April 22 for the purpose of inspecting street paving material with a view to paving some of the streets in this town.

Terre Haute, Ind.—The bd. of pub. wks. has adopted resolutions for paving Lafayette-ave., from Fourth to Maple-ave., with brick on concrete, with stone curbing and concrete sidewalk.

Baltimore, Md.—The board of estimates has reported favorably on the ordinances for paving around the Maryland University and St. Joseph's Hospital with creosoted wooden blocks.

Washington, D. C.—The district commissioners have ordered new curbing and cement sidewalks in various sections of the city, to be done under the provisions of the assessment system.

Buffalo, N. Y.—(Special)—The bd. of pub. wks. has been directed to prepare plans for paving and repaving a large number of streets. This is to be a busy year in the paving line.

Portland, Me.—The construction of granite block and macadam paving on a

number of streets is contemplated. The bitulithic pavement laid on High-st. last year will be continued northward to Cumberland-ave.

Newark, O.—Plans and specifications have been filed for paving Wallace-st. Ordinances have been passed for paving Locust-st., between Fifth and Twelfth-sts., and Wallace-st., between Buckingham and Fourth-sts. Charles H. Wells, cy. engr.

Troy, N. Y.—Resolutions are pending for resurfacing Broadway-st., from Fifth-ave. to track of Troy-Union R. R., with asphalt; resurfacing Union-st., from Broadway to Fulton, and Fulton, from Fifth-ave. to Troy-Union R. R.

Philadelphia, Pa.—A number of improvements are being planned for Fairmont park by Chief Engineer Vogdes including the laying of granolithic walks at Fifty-seventh-st., leading from the Catholic drinking fountain to the Belmont-ave. drive.

Indianapolis, Ind.—Resolutions were adopted April 27 for resurfacing a portion of Virginia-ave. with asphalt; paving Missouri-st., from Market-st. to Kentucky-ave., and certain alleys with brick; constructing cement walks in certain streets.

Pontiac, Mich.—All but three of the bids received April 17 for paving W. Huron-st. were rejected—Warren Bros., Barber Asphalt Paving Company and Lennene Bros. The property owners have petitioned for bitulithic pavement. The matter will be deferred until April 27.

Collingswood, N. J.—The borough council adopted a resolution April 13 to issue $120,000 for street improvements, including grading and an extension of streets, Telford paving, macadamizing, paving, curbing, flagging, etc. Frank North, boro. clk.

CONTRACTS TO BE LET.

Canton, S. D.—Bids are asked until May 11 for 20 cement crossings.

Weston, O.—Bids are asked until May 11 for 6,540 sq. yds. of brick paving.

Napoleon, O.—Bids are asked until May 4 for macadamizing Haley-ave. N. Fisher, clerk.

St. Paul, Minn.—Bids are asked until 2 p. m. May 4 for grading Forest-st. Matt Jensen, cy. clk.

Marion, Ind.—Bids are asked until May 5 for 45,000 sq. yds. of brick paving. T. E. Petrie, cy. engr.

Vincennes, Ind.—Bids are asked until 7:30 p. m. May 11 for grading and graveling Indiana-ave. Com. coun.

Ft. Scott, Kans.—Bids are asked until May 5 for constructing 7 macadam roads. A. J. Sherman, trustee Scott twp.

Celina, O.—Sealed bids are asked until 12 m. May 9 for ditching, graveling or macadamizing roads. M. Lutz, engr.

Stephen, Minn.—Bids are asked by the town board of Donnelly until May 15 for grading 5 mls. of road with ditches.

Cleveland, O.—Bids are asked until May 6 for planking with white oak the north Woodland road. W. H. Evers, cy. engr.

Laporte, Ind.—Bids are asked until May 11 for paving portions of 10 streets with brick and macadam, according to press reports.

Oskaloosa, Ia.—Bids are asked until 7 p. m. May 11 for constructing cement sidewalks and curbing. C. Leighton, cy. clk.

Glenville, O.—Bids are asked until May 4 for asphalt or bituminous macadam paving on St. Clair-st. B. F. Davies, jr., vil. clk.

New Haven, Conn.—Bids are asked until May 4 for crushed stone paving with Belgian block gutters on Cedar-st. C. W. Kelly, cy. engr.

Bluffton, Ind.—Sealed bids are asked until 1 p. m. May 19 for constructing a free gravel road in Lancaster twp. D. O. North, engr.

Princeton, Ind.—Bids are asked until May 5 for constructing 24 mls. of gravel roads. Jonathan W. Phillips, chmn. bd. co. comrs.

Greencastle, Ind.—Sealed bids are asked until May 12 for constructing 9 mls. of stone roads. Thos. H. Brookshire, chmn. co. comrs.

Rockville, Ind.—Sealed bids are asked until 12 m. May 6 for constructing four gravel roads in Florida twp. J. H. Kerr, chmn. co. comrs. Henry Grubb, co. audt.

Buffalo, N. Y.—Sealed bids are asked until 11 a. m. May 8 for paving East-st. from Hertel-ave. to Arthur-st. with each kind of pavement. Francis G. Ward, comr. pub. wks.

Marinette, Wis.—Sealed bids are asked until 12 m. May 15 for macadam paving on Stanton and Liberty-sts., Ella court and Riverside and Newberry-aves. Dan. J. Madagen, chmn. B. P. W.

Toledo, O.—Sealed bids are asked until May 18 for vitrified brick or block, asphalt block, creosoted wood blocks and asphalt paving on a number of streets. Charles H. Nauts, cy. clk.

Garfield, N. J.—Sealed bids are asked until 8 p. m. May 6 for grading, curbing, guttering and sidewalk flagging on Belmont-ave. from Dundee-drive to Cedar-st. Frank E. Kane, boro. clk.

Morristown, N. J.—Sealed bids are asked until 10 a. m. May 4 for macadamizing a section of the Newark and Pompton turnpike in Pequannoe twp. G. A. Becker, dir. bd. chosen freeholders.

Union City, Ind.—Sealed bids are asked until 7 p. m. May 4 for paving Columbia, Pearl and Oak-sts. with vitrified paving brick or blocks on concrete foundation. W. H. Badders, cy. engr.

Waynesburg, Pa.—Bids are asked until May 20 for 19,696 sq. yds. of brick paving. 11,960 lin. ft. curbing, 9,000 cu. yds. grading and 1,000 cu. yds. excavation in 4 streets. S. M. Smith, secy.

Chicago, Ill.—Sealed bids are asked until May 6 for vitrified brick, asphalt, slag, etc., a large number of streets; for cement sidewalks on 36 streets. Andrew M. Lynch, prest. bd. local impvts.

Wichita, Kans.—Sealed bids are asked until May 4 for constructing permanent sidewalk intersections; permanent curb intersections; permanent curb and gutter on Lawrence-ave. J. L. Leland, c. clk.

St. Joseph, Mo.—Sealed bids are asked until 2 p. m. May 9 for paving Ashland-

ave. and Rochester road with macadam, for grading certain roads and constructing 2 culverts. Theo. Steinacker, co. surveyor.

Alexandria, La.—Sealed bids are asked until 4 p. m. May 12 for 19,000 sq. yds. of asphalt paving on Third-st.; 8,500 sq. yds. of vitrified brick paving on Elliott-st. and 10,500 sq. yds. on Third-st. F. M. Welch, mayor.

Beaumont, Tex.—Sealed bids are asked until May 5 for brick or asphalt paving and brick, stone or cement curbing on Calder-ave., Tevis, Orleans, Park, College, Bowie, Main, Keith and Sabine-sts. Thomas H. Laugham, mayor.

Port Huron, Mich.—Sealed bids are asked until 11 a. m May 2 for paving Stone and Military-sts. with brick, Warren's bitulithic pavement or tar macadam; also for paving Pine Grove-ave. with Warren's bitulithic pavement. R. D. O'Keefe, supt. pub. works

Indianapolis, Ind.—Sealed bids are asked until May 4 for paving Thirteenth-st. from Cornell to Roosevelt-ave.; and from Bellefontaine-st. to Cornell-ave. with asphalt. Bids are asked until May 8 for paving Washington-st. from Alabama-st. to Union Ry. Company's tracks with asphalt; grading and gravelling 1st alley west of Central-ave. from Twenty-fourth to Twenty-fifth-sts.; cement sidewalks on English-ave. from Laurel-st. to State-ave. Bids are asked until May 11 for cement walks on Waldon-st. Harold C. Megrew, chmn. B. P. W.

St. Cloud, Minn.—Bids are asked by T. F. Carlin, chmn town of Parlmer (route No. 1), until May 9, for grading and ditching 200 roads.

Madison, Wis.—Sealed bids are asked until 2 p. m., May 22, for paving Park-st. and Washington-ave. with macadam. O. S. Norsman, cy. clk.

Frankfort, Ind.—Bids will be received until May 18 for about 22,000 sq. yds. of brick or bitulithic macadam pavement. Charles E. Cheney, cy engr.

Duluth, Minn.—Sealed bids are asked until May 5 for furnishing St. Louis county with tools for the construction of road work. O. Halden, co. audt.

Watertown, Wis.—Sealed bids are asked until 2 p. m., May 9, for improving N. First, N. Fifth and Third-sts. George H. Stanchfield, chmn. b. p. w.

Crawfordsville, Ind.—Sealed bids are asked until 4 p. m. May 4 for brick paving and cement sidewalks on certain streets. Henry B. Hulett, cy. clk.

Chillicothe, O.—Bids are received until May 4 for constructing Crooked creek, Sulphur Springs, Marietta, Clarksburg and Dogtown roads. Co. engr.

Connersville, Ind.—Sealed bids are asked until May 18 for two miles of gravel streets and two miles of five-foot cement walks. Karl L. Hanson, cy engr.

Riverton, N. J.—Sealed bids are asked until 7:30 p. m. May 7 for 1,500 lineal feet of cement pavement. T. Harry Walnut, boro. cl. F. G. Brown, mayor.

Winchester, Ind.—Sealed bids are asked until 10 a. m. May 4 for constructing a concrete floor in the barn in the jail lot. John H. Boltz, co. audt.

Brookfield, Mo.—Special.—R. N. Bowden, mayor, says bids will be received May 5 for paving seven blocks of Main-st., aggregating about 20,000 square yards.

Montpelier, Ind.—Bids are asked until 8 p m., May 12, for vitrified block roadway, cement walks and curb in Jefferson-st. Josiah F. Jones, cy. clk.

Evansville, Ind.—Bids are asked until May 9, according to press reports, for 1,200 sq. yds. of asphalt paving on Governor-st. August Pfafflin, cy. engr.

Des Moines, Ia.—Sealed bids are asked until 11 a. m. May 18 for paving W. Sixteenth-st., from High-st. to Woodland-ave., with brick. B O. Hanger, chmn. b. p. w.

Hartford City, Ind.—Sealed bids are asked until 7:30 p. m. May 5 for improving Water-st., from Mill to High-st. and from High to Walnut. Charles A. Brown, cy. clk.

Versailles, Ind.—Sealed bids are asked until 12 m. May 5 for constructing five miles and 340 feet of macadamized roads in Johnson township. John A. Spencer, co audt.

Norfolk, Va.—Sealed bids are asked until 12 m. May 14 for 2,200 sq. yds. of asphalt paving on Clay-st. B. Gray Tunstall, chmn. bds. st. sewer and drain comrs.

Vincennes, Ind.—Bids are asked until 2 p. m. May 18 for constructing twenty-one miles and 3,605 feet of gravel roads; also fourteen miles and 3,617 feet of gravel roads. Bd co. comrs.

CONTRACTS AWARDED.

Duluth, Minn.—The contract for cement walks was awarded to the Cement Construction Company for $7,461.

Holyoke, Mass.—The contract for constructing concrete walks during the year was awarded to Warren Bros of Boston.

Albia, Ia.—The contract for paving the principal business streets was awarded to the McCarthy Stone Company of Davenport.

Newport News, Va.—The contract with Warren Bros. of Boston for paving West-ave with bitulithic pavement was signed April 6.

Haverhill, Mass.—The contract for building the Amesbury road was awarded to the Lane Construction Company for $8,659.

Rochester, N. Y.—Whittemore, Rauber & Vicinus secured the contract for paving Clifford-st., from Joseph to Hudson-ave.

Worcester, Mass.—The contract for furnishing granite paving blocks was awarded to the W. A. Flynt Company at $1.60 a sq. yd.

Ocean City, N. J.—The contract for paving the principal streets was awarded to Dixey & Reilley of Atlantic City for $70,000.

Evanston, Ill.—The contract for paving Dempster-st. with granite top macadam has been awarded to Michael Foley for $15,580.25

Columbus, O.—The contracts for constructing sidewalks on forty streets were divided, April 15, between Paul Judge and M. Enright.

New York City—Borough President Cantor opened bids, April 8, for asphalt paving, the prices ranging from $1.08 to $1.10 a sq. yd.

Youngstown, O.—The Cleveland Trinidad Paving Company has been awarded contracts for paving W. Wood-st. and Yale-ave. at $1.95 a sq. yd.

Williamsport, Ind.—The contract for building about 10 mls. of gravel roads was awarded to Moore & Woodward of Bloomington, Ind., for $25,975.

St. Paul, Minn.—The Barber Asphalt Paving Company was awarded the contract, April 16, for repairing eleven streets with asphalt at $1.65 a sq. yd.

Columbus, O.—N. B. Abbott was awarded contracts, April 15, as follows: Paving Trevitt-st., $4.969.80; Noble-st., $2,029.25; Eleventh-st., $2,546.50.

Topeka, Kans.—Paving contracts were awarded April 19 to Ramsey & Ramsey, 11 streets; John Ritchie, 1 street; Wall & Hanley, 4 streets, at prices from $1.16 to $1.19 a square yard.

Lafayette, Ind.—Wm. M. Jackson was awarded the contract for improving Oak-st. from Salisbury to Robinson, with cement sidewalks at 44 cts. a lin. ft.

San Francisco, Cal.—The Barber Asphalt Company was awarded a contract April 8 for repaving and widening Third-st. from Missouri to Berry, for $89,799.43.

Des Moines, Ia.—The contract for paving an alley between Ninth and Tenth-sts. from Walnut to Locust, with brick was awarded April 13 to Bennett Bros., at $1.77 a sq. yd.

Los Angeles, Cal.—The contract for improving W. Third-st. from Fremont-ave. to Boylston-ave. has been awarded to Jacob Hein; for Union-st. from Sixth to Arcadia, W. M. Humphreys.

Nashville, Tenn.—Contracts were awarded April 17 as follows: Curbing, J. E. Lesueur & Company, 50 cts. a lin. ft.; building sidewalks on Bass and Hawkins-sts., Joe Lightman, 44 cts. a sq. yd.

Portland, Ore.—The Carbolineum Wood Preserving Company was awarded the contract for paving First-st. for $10,945.44. S. F. White secured the contract for improving Sherman-st.

Terre Haute, Ind.—The contract for graveling the roadway and paving with concrete the sidewalks of Chase-st. from Thirteenth to Sixteenth, was awarded April 17 to L. F. Perdue for $4,894.87.

Freeport, Ill.—Giacomo Maffiolo was awarded the contract for macadamizing State, Windsor and Winnishiek-sts. for $10,179.59, and for High, Carroll, Empire, Frank and Clifton-sts. for $18,485.40.

Oak Park, Ill.—(Special.)—The contract for paving Marion-st. was awarded to the D. A. Thatcher Paving Company for $18,308. who will use the Metropolitan block sold by E. H. Moore of Chicago.

Meadville, Pa.—Fred Robinson was awarded the contract for paving Chestnut-st. with Mack brick at $1.86 a sq. yd. The contract for paving Water-st. with Metropolitan block was awarded to Thomas McGingan at $1.80 a sq. yd.

Saginaw, Mich.—(Special.)—The Saginaw Clay Mfg. Company has been awarded contracts for furnishing 9,700 sq. yds. of Saginaw blocks for paving Marshall-st. at Battle Creek, and 10,000 sq. yds. for paving Sixth-st., Traverse City.

Waterloo, Ia.—The Barber Asphalt Paving Company secured the contract for 14 blocks of asphalt paving at $1.96 a sq. yd. The contract for 90,000 sq. yds. of brick paving was awarded to Wm. Harrabin of Iowa City, at $1.36 a sq. yd. for flint brick.

Syracuse, N. Y.—Paving contracts were awarded April 15 as follows: Coolidge-ave., Alcatraz asphalt, Empire Contracting Company, $5,835.23; S. Geddes-st., brick, Syracuse Improvement Company, $6,576.60; E. Fayette-st., brick, Syracuse Improvement Company, $5,764.

Linton, Ind.—The contract for paving the main streets with brick was awarded April 21 to Contractor Norton of Vincennes for about $75,000. The work includes 31,000 sq. yds. of brick paving, 17,000 lin. ft. stone curb and 15,000 ft. of sewer.

Memphis, Tenn.—The contract for granolithic paving was awarded April 20 to the Charles R. Miller Paving Company and C. J. Wagner. Contracts for furnishing gravel were awarded to the Southern Railway and the Brunswick Gravel Company at $15 a car.

Macomb, Ill.—The Tri-City Construction Company of Davenport, Ia., was awarded the contract April 20 for paving S. Randolph-st. with brick as follows: Exca. 24 cts, a cu yd.; paving, $1.06 a sq yd; new curbing, 40 cts. a lin. ft.; old curbing, 10 cts. a lin. ft.

Syracuse, N. Y.—The contract for paving Oswego-st. from Gifford to Grace with Nelsonville blocks was awarded to Charles H. Horton for $11,701.30 if the same material is used in the railroad strip, and $12,153.80 if sandstone blocks are used in the railroad strip.

Chicago, Ill.—The R. F. Conway Co. was awarded contracts April 24 for paving an alley with brick and Garfield-ave. and Orleans-st. with asphalt. The Barber Asphalt Paving Co. was awarded a contract for paving a system of streets with crushed limestone and granite.

Erie, Pa.—(Special)—B. E. Briggs, cy. engr., says the contract for repaving Fourth-st, 3,200 sq. yds., was awarded to Mayer Bros. at $1.49 a sq. yd. May 30. The driveway will be 32 feet wide, with street car tracks in the center and will have 1½ inch binder and 2 inch asphalt top.

South Bend, Ind.—Contracts for street improvements were awarded April 18 as follows: Harry N. Barnes, grading, curbs and sidewalks on Allen-st.; De Maude and Woodward-aves.; C. C. Shively, grading, curbs and walks on Calvert and Dayton-sts.; R. Z. Snell, cement walks on California and Milton-aves.; Siders Bros., grade, curb and walks on Indiana-ave.

Fall River, Mass.—The contracts for furnishing granite paving blocks and granite curbing were awarded as follows: Curbing—Archie S. Benoit, 15,000 ft., 67.5 cts. per ft. delivered on street; Timothy Benoit, 10,000 ft., 67.5 cts. delivered. Paving blocks—Archie F. Benoit, 25,000 ft., $58 per 1,000 delivered; Dudovoir & Savoie, 25,000 at $62.50, 25,000 at $65 and 25,000 at $66, delivered; William Beattie, 00,000 at $65 delivered.

Findlay, O.—The lowest bid submitted April 18 for 3,360 sq. yds. of block paving and 1,870 ft. of curb on Defiance-ave. was that of C. B. Hall & Son of this city, which was as follows: Twenty cents per cu. yd. for exca., 36 cts. per ft. for curb and for block per sq. yd. as follows: Peebles, $1.27; Logan, $1.31; Hocking Valley, $1.23; Athens, $1.27; Nelsonville, $1.35; and Metropolitan, $1.22½.

Celina, O.—Bids for 10,220 sq. yds. of block or brick paving were received April 7 as follows: Saml. Monroe, Portsmouth, $22,941; T. J. Mulligan, Lima, $23,852; G. H. Heffner, Celina, $21,216; Philip Hipskind, Wabash, Ind., $25,966; J. O. Shoup, Dayton, $23,682; Trask & Lally, Portland, Ind., $21,744; Henry Gantz, Bowling Green, $23,069; Kelly Bros, Portsmouth, $20,753.

Newark, N. J.—Bids were submitted April 9 for paving as follows: Mt. Pleasant-ave., asphalt, Barber Asphalt Paving Company, at $1.88½ per square yard—$29,997; Mack shale brick, Barber Asphalt Paving Company, at $1.93 per square yard—$30,636. Elliott-st., asphalt, Barber Asphalt Paving Company, $1.88½ per square yard—$7,881.50; Preston wire-cut brick, J. Roosevelt Shanley, $1.97 per square yard—$8,213. Saybrook-place, asphalt, Barber Asphalt Paving Company, $1.88½ per square yard—$3,216; McAvoy brick, J. Roosevelt Shanley, $1.94 per square yard—$3,304.

St. Louis, Mo.—The Granite Bituminous Company was awarded contracts April 15 for bitulithic pavement as follows: Maple-ave., between Hamilton and Hodiamont; Fair-ave., between Algernon and Florissant; Whittier-st., between Easton and Kennerly-aves.; Vernon-ave., between West End and Walton; Theodosia, ave., between Hamilton and Hodiamont; Marens-ave., between Page and Easton and between Easton and Ashland; W. Pine boulevard, from Spring-ave. to King's highway; Union boulevard, from Forest park to Delmar boulevard; Delmar boulevard, from King's highway to Union, from Union to Clara, from Grand to Vandeventer and from Vandeventer to Taylor. Other contracts awarded at the same time were: Barber Asphalt Paving Company, Herbert-st., between Twenty-first and Parnell, and Fountain-ave., between Walton and King's highway; Chapin & Greever, Evans-ave., between Praine and Vandeventer; J. E. Perkinson, Blair-ave., between Newhouse and Ferry; Morey Engineering and Construction Company, Cass-ave., between Jefferson and Garrison, between Garrison and Grand, and from Grand west 660 feet.

SEWERS.

CONTEMPLATED WORK.

Aberdeen, S. D.—A number of sewers are contemplated.

Pleasantville, N. J.—A sewage disposal plant is proposed.

Dedham, Mass.—A sewer in High-st. is proposed.

Sharon, Pa.—The extension of the sewerage system is proposed.

Rome, N. Y.—The extension of the sewerage system is proposed.

Gulfport, Miss.—Estimates for a drainage system will be prepared.

Iowa City, Ia.—An intercepting sewer on Madison-st. is proposed.

Brainerd, Minn.—The construction of considerable sewerage is proposed.

Medina, N. Y.—The construction of more sewers is contemplated.

Oneida, N. Y.—Sewers will be built in Willow and Stone-sts. and Washington-ave.

North Adams, Mass.—An appropriation of $14,851 for surface water sewers is proposed.

Somerville, Mass.—The bd. of aldermen has decided to appropriate $25,000 for sewers.

Circleville, O.—A resolution has been passed for building a lateral sewer in W. Main-st.

Dowagiac, Mich.—Petitions are being circulated for sewers in Telegraph and N. Front-sts.

Fairhaven, Mass.—The estimated cost of 3,800 ft. of sewer in the Pease district is $23,150.

Anderson Ind.—Cy. Engr. Roberts has been directed to prepare plans for sewering Green's branch.

St. Joseph, Mo.—Ordinances were approved April 20 for building sewers in Twentieth-st. and an alley.

Collingswood, N. J.—A system of sewers and drains is contemplated. Richard T. Collings, mayor.

Colorado Springs, Col.—Cy. Engr. Case will report May 4 on the proposed sewer extensions.

Rockford, Ill.—D. W. Mead has been appointed consulting engineer in the Kent Creek sewer matter.

Cambridge, Mass.—The sewer committee has authorized the construction of 19,850 ft. of sewers.

Perth Amboy, N. J.—Ordinances have been introduced for building sewers. John F. Reilley, cy. clk.

Girard, O.—Plans and specifications for a sewerage system and sewage disposal plant have been accepted.

Cortland, N. Y.—The bd. of pub. wks. has decided to build sewer extensions in Lincoln and Maple-aves.

Wilmington, Del.—The st. and sewer dept. has decided to build a sewer in the Ninth ward at a cost of $90,000.

Berwick, Pa.—An ordinance has been passed by the borough council appropriating $60,000 for constructing sewers.

Quincy, Mass.—This city will expend about $45,000 for improvements to the sewerage system. Hamilton Floyd, cy. engr.

Clinton, Ia.—Chas. P. Chase, cy. engr., has completed surveys and prepared a map outlining plans for a sewerage system.

Sterling, Ill.—The bd. of local impvts. acted favorably April 20 on the question of establishing a sewerage system.

St. Paul, Minn.—The bd. of pub. wks. decided April 16 to report favorably on the S. Wabash-st. sewerage system.

Rushville, Ind.—(Special)—A. L. Stewart says that the city council has directed him to make plans, specifications

and estimates for a complete sanitary sewerage system.

Houston, Tex.—Cy. Engr. Dormant has submitted plans and specifications for a sewer system in the Third and Fourth wards.

Norwalk, O.—The cy. clk. has been authorized to advertise for bids for building a sewer in Cortland and Jefferson-sts.

Abilene, Kans.—This city has voted to build a second sewerage system covering the residence portion of town west of Mud Creek.

Louisville, Ky.—The question of issuing $3,000,000 bonds for sewer construction is being considered. Mayor Grainger,

Indianapolis, Ind.—A resolution has been adopted for constructing a sewerage system in Irvington. Harold C. Megrew, chmn. B. P. W.

San Francisco, Cal.—The cy. engr. has recommended the construction of sewers in a large number of streets at a total cost of $49,800.

Baldwinsville, N. Y.—Plans and specifications for a complete sewerage system will be prepared by W. S. Farrington, C. E., of Syracuse.

Albert Lea, Minn.—Plans for a storm water and sanitary sewerage system have been submitted to the city council by City Surveyor Barneck.

Waynesburg, Pa.—(Special)—Geo. D. Jenkins, boro. engr., says that East Waynesburg will put in a sewerage system this summer at a cost of about $8,000.

Hudson, Mass.—This town has decided to construct a system of sewerage in the business portion and an appropriation not exceeding $100,000 will be made.

Syracuse, N. Y.—Governor Odell has signed a bill authorizing the village of East Syracuse to issue $55,000 bonds for construction of a sewerage system.

Grand Rapids, Mich.—Plans and specifications have been adopted and the city clerk authorized to ask for bids for sewers in Morris and Wealthy-aves.

Skaneateles, N. Y.—The estimated cost of a sewerage system is as follows: Sewers, $36,620; disposal plant, $3,250; pumping station, $1,000.

The question of issuing bonds for the construction of sewerage systems will be voted on as follows: Jersey Shore, Pa., May 16; Sumpter, Ore., Lebanon, Ia., June 9; Redwood City, Cal., May 2.

Emmettsburg, Ia.—(Special)—This city contemplates the construction of a sewerage system and desires information regarding the maintenance of a septic tank system. Henry Kneer, supt. w. w.

Buffalo, N. Y.—(Special)—The commissioner of public works has asked for authority to prepare plans and specifications for a brick sewer in certain streets and for a septic tank system to treat the sewage from districts 25 and 26. The council laid the matter over for a week.

The construction of sewerage systems is contemplated at the following places: Rock Falls, Ill.; Moundsville, W. Va.; Lewiston, Ill.; Blakesburg, Ia.; Coon Rapids, Ia.; Red Lodge, Mont.; Woodstock, Ill.; Ballard, Wash.; Flora, Ill.; Jeffers, Minn.; Black Duck, Minn.; Plattsburg, N. Y.; Sanbury, Pa.; Sioux Falls, S. D.; Sydney, N. S.; Salem, Mass.

Jackson, Mich.—(Special)—A. B. Stevens, city engineer, says that this city voted April 6 to issue $100,000 bonds for constructing sewers and improving the ground near. The city had previously issued bonds to the amount of $25,000 and the state had appropriated $15,000 for the same purpose. The state was interested on account of the state prison. It is now proposed to construct a purification plant and an intercepting sewer on one side of the river.

CONTRACTS TO BE LET.

Cleveland, O.—Bids are asked until May 14 for a sewer in Colgate-st. C. P. Salen, dir. pub. wks.

Slayton, Minn.—Bids are asked until May 9 for constructing ditch No. 2. Ole O. Holmen, co. audt.

Washington, D. C.—Bids are asked until May 21 for a sewer system at Chamberlain, S. D. Indian Dept., Washington.

Beaumont, Tex.—Sealed bids are asked until May 5 for constructing brick and pipe sewers. Thos. H. Laughan, mayor.

Crawfordsville, Ind.—Sealed bids are asked until 4 p. m. May 4 for a sewer in Mill-st. Henry B. Hulett, cy clk.

Poughkeepsie, N. Y.—Bids are asked until May 5 for building sewers in portions of 7 streets. Chas. W. Fowler, supt. P. W.

New London, Conn.—Bids are asked until May 7 for constructing a submerged 18-in. wooden outfall sewer. Bd. sewer comrs.

Noblesville, Ind.—Bids are asked until 7:30 May 11 for 2,750 ft. of 12-in. sewers. A. A. Glenn, cy. clk.

Montpelier, Ind.—Bids are asked until 8 p. m. May 12 for a salt-glazed vitrified pipe sewer. J. F. Jones, cy. clk.

St. Paul, Minn.—Bids are asked until May 4 for a sewer in Oakdale-ave. and Minnehaha and Rondo-sts. B. P. W.

Henderson, Minn.—Bids are asked until May 9 for constructing ditch No. 9 in the town of Grafton. A. C. Buck, co. audt.

Pocahontas, Ia.—Bids are asked until 2 p. m. May 18 for constructing a tile drain in district No. 6. Geo. W. Day, co. audt.

Bowling Green, O.—Bids are asked until May 9 for building circular pipe sewers in certain streets. Alex. Williamson, cy. clk.

Belleville, Ill.—Bids are asked until May 5 for 4,600 ft. of brick sewer in W. Main-st. G. H. Beinecke, secy. bd. local impvts.

Amsterdam, N. Y.—New bids will be received May 20 for building sewers on E. Main-st. and Guy Park-ave. F. E. Crane, supt. sewers.

Lockport, N. Y.—Bids are asked until May 4 for 1,200 ft. of 10-in. drain and 6-in. water pipe in Evans-st. Julius F. Freihsee, cy. engr.

Chicago, Ill.—Sealed bids are asked until May 6 for constructing drains in certain streets Andrew M. Lynch, prest. bd. local impvts.

Des Moines, Ia.—Sealed bids are asked until 2 p. m. May 15 for constructing a

sewage purification plant at Ft. Des Moines. Maj. R. B. Turner, Q. M.

Glenville, O.—Sealed bids are asked until 12 m. May 4 for building sewers in St. Clair-st, from Dungway Brook to St. Clair-st. B. F. Davies, jr, vil. clk.

Bond Hill, O.—Sealed bids are asked until 12 m. May 20 for building sewers. A. J. Kiphart, vil. clk.; Earnshaw & Punshon, vil. engrs., Glenn Bldg., Cincinnati.

Olathe, Kas.—Bids are asked until May 5 for constructing 4,980 ft. of 8 to 24-in. pipe sewer, with eight manholes in lateral district, No. 2 C. F. Garnord, cy. clk.

Washington, D. C.—Sealed bids are asked until June 6 for constructing sections B and C of the B and New Jersey-ave. trunk sewer. H. B. F. MacFarland, chmn. dist. comrs.

Depew, N. Y.—(Special.)—Sealed bids are asked until May 4 for constructing a 15-in. tile sewer in Meridian-st., from Litchfield-ave. to Gould-ave. F K. Wing, vil. engr., Buffalo, N. Y.

East Chicago, Ind.—Sealed bids are asked until 7:30 p. m. May 4 for 29,242 ft. of 24, 20, 18, 15, 12, 10 and 8-in. tile sewer, 150 manholes, 181 catchbasins, and 1,387 house connections. H. E. Jones, cy. clk.

Des Moines, Ia.—Sealed bids are asked until May 11 for a 12-in. clay pipe sewer in E. Ninth-st., and until May 18 for a 12-in pipe sewer in W. Third-st., and a 15-in. pipe sewer in W. Fifth-st. B. O. Hanger, chmn. b. p. w.

Newark, N. J. — Bids will be received May 15 for constructing section 5 of the joint outlet sewer for Newark, Irvington, South Orange, Summit, West Orange, Millburn, and Vailsburg. W. L. Glorieux, chmn. com., 124 Market-st.

Ardmore, Pa.—Sealed bids are asked until 4 p m. May 4 for constructing a system of sewers, with Y branches, manholes, etc., and two collecting basins and a pumping station for the township of Lower Merion. Chester E. Albright, C. E., 908-9 Land Title Bldg., Philadelphia.

Connersville, Ind.—Sealed bids are asked until 7:30 p. m. May 1 for constructing a combined storm and sanitary sewer system, including 7½ mis. of brick and pipe sewers ranging from 6 ins. to 4 ft. in diameter, with outlets, inlets, catchbasins, manholes, etc. Karl L. Hanson, cy. engr. Jacob S. Cloud, cy clk.

CONTRACTS AWARDED.

Jeffersonville, Ind.—The contract for a sewer in Court-ave. was awarded April 10 to W. O. Sweeney for about $2,200.

Bridgeport, Conn.—The contract for extending the Thompson trunk sewer was awarded to the Pierce Mfg. Company for $12,443.

Lewiston, Idaho.—The contract for a sewerage system on Normal Hill was awarded April 9 to Naylor & Naslin for $37,230.

Tacoma, Wash.—Harold Olson has been awarded a contract for constructing a sewer in sewer district No. 31 for $1,530.

Canajoharie, N. Y.—The contract for a new sewerage system was awarded April 18 to John Vaughn of Stamford, N. Y., for $24,000.

Portland, Ore.—The Robinson Construction Company has been awarded a contract for building sewers in E. Davis, E. Glisan and E. Everett-sts.

Pueblo, Mex.—A franchise for a sewerage system has been granted to an American syndicate represented by Stephen Sheppard of New York City.

Austin, Tex.—The contract for constructing a storm sewer on Congress-ave. was awarded April 13 to John Fields of Ft. Worth for $19,338.74.

Marshfield, Wis.—The Municipal Engineering and Construction Company of Chicago submitted the lowest bid for completing the septic tank at $40,365.

South Orange, N. J.—The contract for laying 16,000 ft. sewers and house connections was awarded April 20 to Ludwig Batt of this city for $5,630.

Hazleton, Pa.—Contracts for sewers were awarded April 17 as follows: Stone sewer, 620 feet, Jacob Jacoby, city, $6,-607; pipe sewer 880 feet, A. Ruth, city, $3,083.

Columbus, O.—Sewer contracts were awarded April 18 as follows: Central relief sewer, McCracken & Co., $68,186.84; Beck-st. sewer, McCracken & Co., $35,-576.77; alley south of Green Lawn, Lewis Lind & Co., $12,064.30; West Side sewer, Lee & Casey, $31,737.31.

Santa Ana, Cal.—(Special.)—S. H. Finley, prest. bd. trustees, says that a contract has been awarded to C. M. Nash for 1 mi. of additional main sewer to reach a portion of the city heretofore beyond the scope of the sewerage system.

Milwaukee, Wis.—Sewer contracts were awarded April 23 as follows: Brick sewer in Center-st., Geo. E. Zimmerman, $7.73 a lin. ft.; pipe sewer, Marden lane, W. F. Werner, $1.46; pipe sewer, Ellen-st., F. H. Nadielski, $1.98; pipe sewer, Russell-ave., Herman Hohensee, $1.47; brick sewer, Western-ave., Geo. J. Markey, $6.44.

WATER-WORKS.

Monroe, La.—This city has purchased the plant of the Monroe Water Works and Light Company for $60,000.

Fishkill Landing, N. Y.—The water plant which supplies this village will be sold at foreclosure on May 8.

Cedar Rapids, Ia.—This city has purchased the water works system for $473,-000 and will settle all suits pending in court, which will amount to about $20,000.

Newly incorporated water companies: Clymer Water Company, Indiana, Pa.; Paden Valley Company, Pittsburg, Pa.; Cape Girardeau Water Works and Electric Light Company, Cape Girardeau, Mo.; Little Falls Water Company, Little Falls, N. J.

Tuscaloosa, Ala.—Suit has been filed against the Tuscaloosa Water Works Company to annul the charter and dissolve the corporation on the charge of using alum in filtering the water, insufficient pressure in pipes and failure to extend the mains to certain parts of the city when ordered to do so by the mayor and board of aldermen.

CONTEMPLATED WORK.

Richmond, Mo.—A filter plant is proposed.

Union, Or.—This city will lay about 5,000 feet of water mains.

Sheboygan, Wis.—This city voted to build a new water works plant.

Grand Rapids, Mich.—This city voted to issue $170,000 for water mains extension.

Sioux City, Ia.—This city's water plant will be extended. J. M. Lewis, cy. engr.

Elgin, Ill.—The residents on Mosely-st. have petitioned for water mains.

Gulfport, Miss.—Estimates will be made for establishing water works.

Grand Rapids, Wis.—The extension of the water system is contemplated. Mayor Wheelan.

Concord, Mass.—The extension of the water system is proposed. W. A. Carr, town clerk.

Juneau, Wis.—This city voted to issue $3,500 bonds for extending the water works system.

Salem, S. D.—A compressed air system of water works may be installed. Jerome Sweinhart, mayor.

Bristol, Va.—The city council decided April 19 to expend $15,000 in improving the city water works.

Benton Harbor, Mich.—Plans and specifications have been adopted for additions to the pumping station.

South Braintree, Mass.—Council voted to extend the water system to Holbrook line. T. H. Stevens, chmn. water bd.

Wayland, N. Y.—Bids will be received about May 15 for the proposed new municipal water works. W. H. Deitzel, vil. prest.

Mansfield, Mass.—This town contemplates issuing $10,000 bonds for extending the water mains and other improvements.

Carrollton, O.—The water works trustees have asked the council to appropriate $500 for extending the water mains on Grant-st.

Minneapolis, Minn.—The Senate passed a bill authorizing this city to issue $100,000 for the extension of the water works system.

Williamsburg, Mass.—This town has voted to build a reservoir and obtain a water supply from Nonquemonk Brook. H. C. Smith, chmn. water com.

Silverton, Colo.—About 1½ mls. of 10-in. galvanized iron water pipe is desired for proposed increase of water supply. N. A. Bullan, mayor.

Lancaster, Pa.—Plans and specifications have been submitted for the improvement of the water supply. Mayor Cummings, chmn. special water com'n.

Littleton, N. H.—An engineer will be engaged soon for the proposed pipe line to the north branch of Gale river. Myron H. Richardson, secy. water comrs.

Santa Ana, Cal.—(Special.)—S. H. Finley, prest. bd. trustees, says this city has just completed the laying of half a mile of additional water mains.

New Britain, Conn.—The water dept. has decided to build a new main from Shuttle Meadow, through Vine and Curtis-sts. to Myrtle-st. at a cost of about $20,000.

The question of issuing water works bonds will be voted on as follows: Wilmot, S. D., May 4; Lake Preston, S. D., mour, S. D., May 4; Lake Preston, S. D., May 5; Mt. Vernon, S. D., May 4.

The question of issuing water works bonds has been favorably voted on at the following places: Montevideo, Minn.; Nashwauk, Minn.; Port Arthur, Ont.; Spencer, S. D.; North Liberty, Ind.; Centre Ossipee, N. H.; Mainville, Pa.; Vermillion, O.; Tishomingo, Ind. Ter.; Alturas, Cal.; Oakland, Cal.

CONTRACTS TO BE LET.

Sterling, Col.—Sealed bids are asked until 6 p. m. May 18 for a water works system. Town clerk.

Corvallis, Ore.—Bids are asked until May 10 for a water works system. E. P. Greffoz, police judge.

Toronto, Ont.—Bids are invited until May 12 for erecting one 15,000,000 gal. pumping engine. Thos. Urquhart, mayor.

Kiester, Minn.—Bids are asked until May 4 for boring an 8-inch well for a water supply. C. W. Tuebuer, vil. recorder.

New Bremen, O.—Sealed bids are asked until May 19 for a water works system. Thos. Flock, chmn. bd. trustees of pub. affairs.

Martinsburg, W. Va.—Bids are asked until May 21 for constructing a pumping plant and improving the water supply. Wm. R. Kline, chmn.

Holyoke, Mass.—Bids are asked until May 11 for furnishing 600 tons of 20-inch c. i. pipe and special castings. John J. Sullivan, chmn. water comrs.

Newark, N. J.—Sealed bids are asked until May 7 for the construction of 2 gate houses for Cedar Grove reservoir. Morris R. Sherrerd, engr. and supt. dept. water.

Dexter, Me.—Bids are asked until May 7 for laying 6 miles of water pipe and setting special castings, valves, hydrants, etc. Arthur A. Abbott, chmn. water comrs.

Cheyenne, Wyo.—Sealed bids are asked until May 8 for extending the present water system at Ft. D. A. Russell, Wyo. Capt. W. S. Scott, Const. Q. M., Cheyenne.

Atlantic City, N. J.—Sealed bids are asked until May 5 for installing a pumping plant of 3,000,000 gals. per day from 12 artesian wells. Louis Kuehnle, chmn bd. water comrs.

Tacoma, Wash.—Bids are asked until May 20 for 1,400 ft. 6 in., 2,700 ft. 8 in. and 300 ft 12 in. wood pipe for water mains, with specials and gate valves. N. L. Taylor, cy. engr.

Washington, D. C.—Sealed bids are asked until May 22 for Venturi meters, sluice gates and gate valves, special castings, pumping engines, boilers, stokers and economizers, A. M. Miller, Lt. Col. Engrs.

Richmond, Va.—Bids are asked until May 15 for constructing a steel substructure and steel tank, including furnishing and erecting 16 in c. i. flanged pipe and 8 in. waste pipe. Chas. E. Bolling, supt. city w. w.

Tucson, Ariz.—Sealed bids are asked until 12 M. May 20 for furnishing a cross-compound crank and fly-wheel high duty pumping engine of 4,000,000 gals. capacity in 24 hours. C. F. Schumacher, mayor; F. S. Treat, cy. clk.

New York City.—Bids are asked until May 5 for furnishing and delivering c. i.

water pipes, branch pipes and special castings, double and single nozzle "New York" case hydrants, cocks, curb cocks, soldering nipples, hydrant nozzles, waste cocks and bridge for Boros. Manhattan and Bronx. Robt. Grier Monroe, comr. water supply, gas and elect.

CONTRACTS AWARDED.

Allentown, Pa.—The contract for extending the water works was awarded to George H. Harden.

Downs, Wash.—The contract for 6,300 feet of water pipe for the water works was awarded April 10 to the Washington Pipe Company.

Columbus, O.—D. W. McGrath secured the contract for a 1,000 barrel fire cistern at the West Side pumping station for $11,088.

Richfield, Utah.—The contract for supplying the pipe for the water works was awarded to the Crane Company of Salt Lake City for about $17,000.

Atlantic City, N. J.—The contract for a concrete dam in the canal leading from the Absecon reservoir to the pumping station was awarded to C. J. Kelly for $5,946.

Wilmington, Del.—The contract for the reconstruction of the water works system of this city was awarded to the United States Sand Filtration Company of Indianapolis at a price between $600,000 and $700,000.

Schenectady, N. Y.—The contract for laying new water mains was awarded April 19 to Joseph H. Clements for $6,587.50. The Ludlow Valve Manufacturing Company of Troy will furnsh fire hydrants; Rensselaer Manufacturing Company gate valves and boxes; Charles Miller & Son, Utica, c. i. pipe and special castings.

Washington, D. C.—Contracts for the construction of the filtration plant were awarded as follows: Excavation and concrete work, Cowardin, Bradley, Clay & Co. of Richmond, Va., $969,694; steel and c. i. pipe and drainage system, Brennan Construction Company of Washington, $225,535; sand and gravel, L. E. Smoot, Washington, $487,855; total, $1,703,084.

BRIDGES.

Palmer, Mass.—This town has voted to build two bridges.

Milwaukee, Wis.—A bridge at Muskogee-ave. has been petitioned for.

Skowhegan, Me.—This town voted to build a steel bridge over the Kennebec river.

Grand Rapids, Mich.—Bids have been authorized for the new bridge across the river at Bridge-st.

Columbia City, Ind.—Bids are asked until May 8 for stone culverts and steel bridges. Co. comrs.

Sullivan, Ind.—Bids are asked until May 8 for 11 steel or concrete bridges. J. M. Lang, co. audt.

Mackinaw, Ill.—This town voted to build an iron bridge over the Mackinaw river at Stout's ford.

Carrollton, Mo.—Bids are asked until May 5 for wood or steel bridges. Silas Ballard, bridge comr.

Boonville, Ind.—Bids are asked until May 4 for an iron bridge in Pigeon twp. R. D. O. Moore, co. clk.

Auburn, Ind.—Bids are asked until May 14 for steel bridges, concrete abutments and concrete arches. Bd. co. comrs.

Waterville, Me.—The city council voted to build a steel bridge across the Messalonskee at the pumping station.

Milwaukee, Wis.—Bids are asked until May 19 for a highway bridge at Water-st. Charles J. Poetsch, cy. engr.

Winchester, Ind.—Sealed bids are asked until May 16 for 7 bridges and abutments therefor. John H. Boltz, co. audt.

Hamilton, O.—Sealed bids are asked until May 8 for the repair of the Main and High-st. bridge. Chris. Pabst, co. audt.

Pawnee, Ok.—Bids are asked until May 8 for a bridge over the Arkansas river, near Cleveland. C. R. Adams, co. clk.

Winamac, Ind.—Bids are asked until May 5 for a two-span iron truss bridge over Tippecanoe river. Ellis S. Rees, co. audt.

Astoria, Ore.—Bids are asked until May 5 for a steel drawbridge across Lewis and Clark river. J. C. Clinton, co. clk.

Greensburg, Pa.—Bids are asked until May 14 for a steel bridge across Big Sewickley creek at Gratztown Station. John H. Brown, co. compt.

Salem, Ind.—Bids are asked until May 6 for building stone abutments and making approaches for a bridge over Lost river. Frank E. Morris.

Vicksburg, Miss.—Bids are asked until May 4 for a bridge on road 81, near Hundermark's store. J. D. Laughlin, Chancery clk.

Bangor, Me.—Plans are being prepared by P. H. Coombs, cy. engr., for constructing a bridge over the Kenduskeag at the foot of Water-st., West Side.

South Bend, Ind.—The county commissioners have asked the council for an appropriation of $300,000 for building two new iron bridges in this city.

Grand Rapids, Mich.—Sealed bids are asked until May 15 for a concrete or concrete steel arch bridge across Grand river at Bridge-st. Joseph Emmer, pres't. B. P. W.

Gettysburg, Pa.—Bids are asked until June 1 for a steel bridge on Reynolds-ave. over Western Maryland R. R. John P. Nicholson, chmn. Gettysburg Com'n.

Frankfort, Ind.—Sealed bids are asked until May 6 for constructing a large number of stone or concrete arches, brick culverts, etc. Lincoln Cox, chmn. co. comrs.

Magnolia, N. J.—Sealed bids are asked until May 12 for building two steel drawbridges on the new highway from Pleasantville to Atlantic City. Frank Enderlin, chmn. bridge com.

Indianapolis, Ind.—Sealed bids are asked until May 22 for a bridge over Fall creek on College-ave.; over creek in Washington twp.; over Little White Lick creek near Bridgeport. John McGregor, chmn. co. comrs.

Corning, N. Y.—Bids are asked until May 4 for a bridge over Chemung river; for repairing three piers and abutments

of Gibson highway bridge and for cement walk on same bridge. C. F. Parks, comr.

Harrisburg, Pa.—Bids are asked until May 5 for rebuilding the substructure of the bridge across the Schuylkill river near Auburn. James M. Shumaker, supt.

STREET LIGHTING.

Beloit, Wis.—A municipal electric lighting plant is favored.

Wellsville, O.—A municipal electric light plant is proposed.

Muscatine, Ia.—The business men are subscribing to a fund for erecting an electric light plant.

Los Angeles, Cal.—Bids are asked until May 16 for an electric plant at Ft. Rosencrans, Cal. Capt. Edgar Jadwin, U. S. Engrs.

Manchester, Mass.—This town has voted to authorize a local corporation to construct and maintain an electric light plant.

Cleburne, Tex.—A 50 yr. franchise has been granted the Cleburne Lgt. Power and Heating Company for installing a gas plant.

Bluffton, Ind.—The contract for an incandescent and street lighting plant has been awarded to the Olds Const. Company of Ft. Wayne for $24,950.

Vernal, Utah.—Contracts will be let about July 1 for the plant of the Vernal Lgt. and Power Company in Ashley Canyon. E. W. Davis may be addressed.

Ashland, Ky.—Bids are asked until May 4 for lighting the streets with arc electric lights for 5 and 10 years. R. C. Richardson, cy. clk.

Toronto, Ont.—Bids are asked until May 11 for constructing a tail-race tunnel for the Toronto & Niagara Power Company. Fred Nicholls, vice-president and mgr. Home Life Bldg.

Shelbyville, Ind.—The contract for electric lighting has been awarded to the Shelbyville Water and Lgt. Company at $60 each for arc lights and $18 each for incandescent lights.

The construction of electric light plants is contemplated at the following places: Brookville, Fla.; West Point, Miss.; Camden, N. Y.; Saybrook, Ill; Belding, Mich.; Belvidere, Ill.; Capac, Mich.; Anita, Ia.; Neola, Ia.

Portland, Ore.—Bids are asked until June 18 for lighting streets, avenues parks and other public places by 2,000 c. p. electric arc lights and for lighting public buildings by incandescent, electric or gas lamps for 5 years. Thomas C Devlin, cy. audt.

Rochester, N. Y.—(Special.)—Bids are to be received May 6 for installing engines and generators, switch boards, eltctric light wiring and fixtures, telephone and watchman's clock at the Rochester State Hospital, Rochester, N. Y. E. H. Baker, superintendent.

Binghamton, N. Y.—Bids were received April 10 for Welsbach street lights for terms of 1, 5 and 7 years as follows: Charles S. Wales of this city—To use a lamp made in Canton for either gas or naphtha for one-year contract, $30.50 per lamp per year; two years, $29.50; three years, $28.50; to use a Cleveland lamp, ninety cents a year more for each bid. The Sun Vapor Street Light Company of Canton, O.—For naphtha lamps, one year, $22.40 per lamp per year; three years, $22.25; five years, $22.15, and seven years, $22; for gas lamps, one year, $23; three years, $22.75; five years, $22.65, and seven years, $22.50. Cleveland Vapor Light Company—For either gas or naphtha, for one year, $30.35 per lamp per year; three years, $29; five years, $28.65; seven years, $28.20. The Welsbach Street Lighting Company, which has the present contract—For naphtha or gas, one year, $32 per lamp; three, five or seven years, $30.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Reading, Pa.—The contract for garbage disposal was awarded to C. C. Fisher at $2.24 per ton.

Shreveport, La.—Bids are asked until May 18 for erecting a crematory for the incineration of garbage. C. G. Rives, cy. compt.

Terre Haute, Ind.—Bids for the collection and removal of garbage were received April 20 for three and five years. Action on the bids was deferred.

Mankato, Minn.—The contract for garbage collection is recommended by the health commissioner. The sprinkling contract was awarded to John Page.

Chicago, Ill.—Plans for garbage crematory of 120 tons daily capacity are being prepared. The plant will be erected on the Bridewell grounds. F. W. Blocki, comr. pub. wks.

PARKS.

Canton, O.—Plans have been adopted for a new water works park.

Perth Amboy, N. J.—Mayor Seaman has deeded to the city the triangle between Fayette-st. and New Brunswick-ave., for a small park.

Des Moines, Ia.—(Special.)—A contract has been awarded Nelson Bros., 145 Hartford building, Chicago, for plans for a new city cemetery. The total area is 190 acres, only sixty acres of which will be opened at present. They have been retained by the Street Car Company of Des Moines to improve their Ingersoll Park.

FIRE APPARATUS.

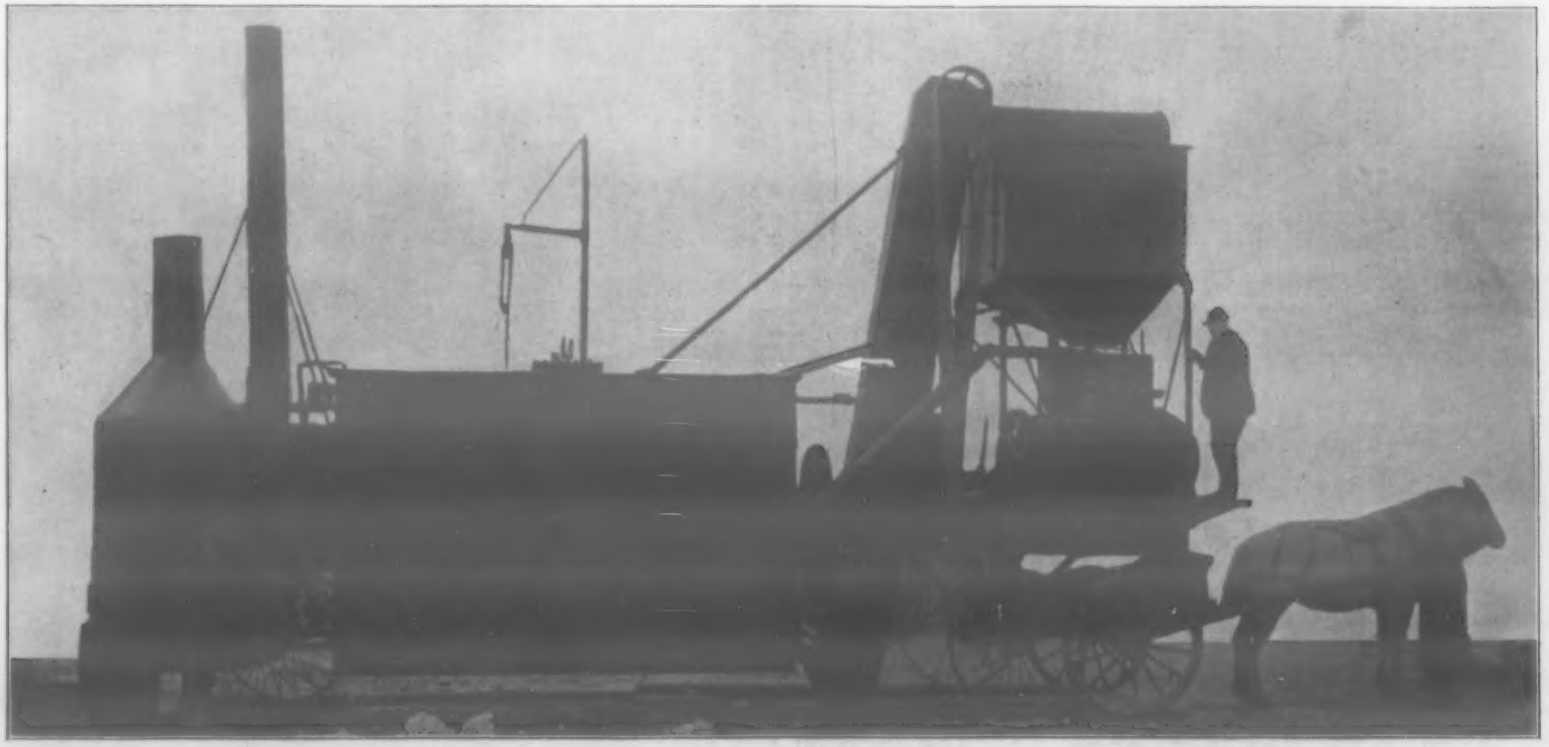
Corydon, Ia.—Bonds have been voted to purchase a fire engine.

Mobile, Ala.—Chief Price has recommended the purchase of two fire engines.

Port Huron, Mich.—The fire department com. desires to purchase a steam fire engine this year.

THE TOLEDO ASPHALT PATCHER CO.

MANUFACTURERS OF PORTABLE ASPHALT AND MACADAM PLANTS, SAND DRIERS, MIXERS, TOOLS, ETC.



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